Practical Computing

SPECIAL ISSUE
Word processing

80p February 1983 Volume 6 Issue 2

REVIEWS

Victor 9000 — the DRG 'Sirius 1'

New from Japan: Epson QX-10 and Toshiba T-100

Disc drives for the BBC Micro from LVL

Cromemco System One

MicroCentre introduce Cromemco's new System One computer, available with an integral 5 megabyte Winchester hard disk, at a new low price.

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Northern office:
Geoff Aikin 061-872 8861
PUBLISHING DIRECTOR
Chris Hipwell

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Protecting U.K. micro builders

THE BRITISH MICROCOMPUTERS Manufacturerers' Group recently presented a letter to the Prime Minister asking her to ban for one year all imports of Japanese and American microcomputers. The group argues that imports are already taking 90 percent of the market and that British manufacturers are about to be wiped out.

Now not every British micro manufacturer is a member of the BMMG, whch is a fledgeling organisation. Not every member of the BMMG is fully behind the import ban: Sinclair is, for example, one exception. Nor probably, does any member of the BMMG seriously think such a ban is going to be imposed. However the BMMG does have cause for complaint and has drawn attention to them.

The first problem is the list of microcomputers prepared by the government's procurement agency the CCTA (Central Computer and Telecommunications Agency). This includes imported micros but excludes some well-known British names.

It seems admirably fair for the British government to recommend its departments to buy foreign micros and we could only wish that the Japanese and American governments would show similar open-mindedness. Of course they don't. However, it is the exclusion of British manufacturers that really rankles. Some members of the BMMG receive government support, in the form of grants, to produce microcomputer products. Meanwhile the government procurement agency prevents them from selling these products to other government departments.

This surely is ludicrous. If products are good enough to receive government funding then they should be good enough for the government to buy. That foreign products are recommended instead merely rubs salt into the wound.

Sadly, exclusion from the CCTA list does not only affect purchases by government departments. The list is published, so to other potential buyers may be influenced by it. This apparent lack of government approval can hardly help any vigorous export drive.

A second point, raised particularly by Sinclair, is that government import duties discriminate against U.K. manufacturers. The duty on imported components is 17 percent, but on most fully assembled products is only six to seven percent, which must give an advantage to the overseas manufacturer.

So there are at least two things the government can do to help: revise the CCTA list and change the way import duties work.

Having said that, the members of the BMMG can do a few things to improve matters themselves. Often their products are technically exciting, but they do not always put as much effort as they should into other areas, such as styling, marketing, and delivery systems on time. No names, no pack drill. It is, however, worth noting that the Dragon has been a great success in the U.K. despite the fact that it is not a very interesting or sophisticated machine. Advertising, availability and price have so far proved more important.

Finally, is British microcomputer manufacturing really on the point of extinction? In the home-computer field, exemplified by Sinclair, we would say not. In the nearly-mini business field, exemplified by Systime, we would say not. In the mid-range business field, maybe.

The reason is that the U.S. competition is already tough, and now the Japanese are poised to swamp us with vast quantities of business micros. They will probably not be very interesting technically, but they will be well advertised, available and cheap. Those qualities are hard to argue with.

5 Years ago...

The early microcomputer hobby customer base was amazing in the fervour with which it pursued products. Customers were so eager to buy that they established an industry payment practice which was initially necessary — but which has become a liability.

It is the practice of paying in advance for products, frequently months in advance of delivery. In the early days of the personal computing industry, front-end payments were absolutely necessary, since manufacturers had no track record, no visibility, and no chance of obtaining loans or funding through any traditional sources.

Instead, they were forced to advertise a product before it existed, demand cash payments with orders, and then spend the cash to build the product which had been ordered.

This is called "forward financing", it works while business is increasing rapidly and products are designed on time. Business has, indeed, increased rapidly, but products have not always been designed on time. Frequently they have been very late or have not worked at all.

Dr Adam Osborne

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74S133	115
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75491/2	65
74S112	90

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7410	14
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7423	18
7414	20
7420	15
7422	20
7427	18
7430	14
7442	32
7447	40
7400	11
7448	40
7473	24
7474	20
7475	25
7485	60
7486	20
7489	170
7490	20
7491	35
7492	25
7493	25
74100	80
74116	50
74121	25
74125	35
74126	35
74143	210
74148	60
74150	50
74151	40
74153	40
74154	55
74186	470
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LS02	11
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LS75	20
LS85	42
LS86	16
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LS93	23
LS125	24
LS126	25
LS138	25
LS139	28
LS148	70
LS151	40
LS153	40
LS156	36
LS157	27
LS158	30
LS175	50
LS240	55
LS241	55
LS242	55
LS243	55
LS244	55
LS245	70
LS273	54
LS373	60
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LS393	42
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LS641	180
LS645	180
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LS669	120
LS670	100
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4027	20
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4066	24
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4077	13
4081	13
4093	20
4099	75
4160	95
4161	99
4162	99
4163	99
4174	99
4175	105
4411	690
4412	790
4419	350
4450	350
4451	350
4490	350
4500	675
4501	75
4504	75
4505	185
4508	130
4511	46
4519	30
4528	50
4549	375
4569	175
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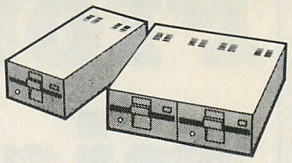

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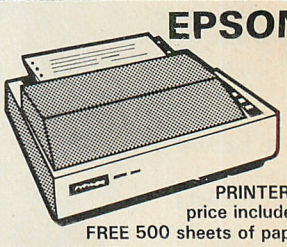

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2 0MHz	225	24 0MHz	170
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3 57594	98	48 0M	175
3 6864M	300	100 0M	375
4 0MHz	150		
4 433619	100		
5 0MHz	160		
6 0MHz	140		
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2×25way		225p
2×28way		195p
2×30way		245p
2×36way		295p
2×40way		315p
2×43way		395p

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	9 way	15 way	25 way	37 way
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Solder	80p	110p	160p	250p
Angle	160p	210p	250p	355p
Pins	120p	130p	195p	295p
Female				
Solder	110p	160p	210p	350p
Angle	165p	215p	290p	440p
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A great new career for Kenneth Baker

THANK YOU for printing Boris Allan's common-sense article about Information Technology Year — December 1982 issue, page 141. It made a welcome change from the high-powered propaganda that we have come to associate with IT 82.

As part of my work as an independent consultant, I have been asked to advise dozens of companies who neither need nor can afford microcomputers but who are being scared — I use the word in its literal sense — into new technology. They have seen the ads: the seven-year-old who is "better equipped to run the office than you are"; the technology that is better in the pub than in the office.

Worse, they believe this nonsense. So instead of making rational investment decisions they rush out in a panic to buy, as if there were indeed "no future without it".

IT 82 did a great job in pushing American and Japanese hardware into businesses that were not always in a position to use it. It did nothing to make those businesses more competitive or more likely to survive. If Kenneth Baker ever leaves politics he can have a great career selling soap powder.

Mike Lewis,
London NW3.

Printer interfaces

GEORGE HILL'S ARTICLE on page 155 of November's *Practical Computing* did not mention to which model of Microline printer he was referring. Having a Microline 82 I was surprised to note that the Dip switch settings in figure 3 select a German character set and the parallel interface, which would make little sense of a serial output from a BBC Micro.

For the benefit of others with Microline 82s the correct Dip settings are.

Front board	Rear board
1 Off	1 On
2 On	2 On
3 Off	3 Off
4 Off	4 On
5 Off	5 On
6 On	6 Off
7 Off	
8 On	

P S Rickets,
Manchester.

Computer wanted

I HAVE a terminal but no computer. It has standard V-24 20mA interface with TTY-compatible keyboard. I would like to interface this to a single-board computer preferably with 8K minimum RAM.

Judging by numerous unanswered enquiries some U.K. distributors seem uninterested in small export orders. Perhaps they forget Apple grew from a secondhand VW.

Would any readers be in a position to assist? A secondhand board, even self-assembled, might do the trick.

Des O'Brien,
Dublin.

Advantage problems

I HAVE JUST SEEN in the June issue the article by Mike Hughes on the North Star Advantage. The first point is in that your specifications column, the distributor is quoted as Comart Ltd. As a point of information, Comart is just one distributor: we are another.

Point two is the problem which "North Star, through Comart ought to sort out". We have sorted it out, and distributed the solution to our dealers through our monthly newsletter. The May edition contained the following.

TECHNICAL TIPS: Your Questions answered.

Q: Can you supply a patch to CP/M for the Advantage to prevent a possible crash when ASCII 255 (DEL) is sent to the screen?

A: The fix for the problem described is as follows:

1. Modify CPMGEN.COM
2. Save the new version under a new name (e.g. NEWGEN.COM)
3. Regenerate your system
4. Try to recreate the failure
5. If the fix works, delete the old CPMGEN.COM, and rename NEWGEN.COM to CPMGEN.COM.

The fix is:

1. DDT CPMGEN.COM
2. NOP (ZERO OUT) locations 3612 + 3613
3. Exit DDT
4. Save the file
5. Test the fix
6. Scratch the old and rename the new.

Thirdly in your conclusions sections, you suggest that WordStar be "patched to make use of the 15 function keys": we have in stock Enhanced WordStar for the Advantage which does, in fact, use the function keys, both alone and shifted, for the 30 most common operations and includes an adhesive legend strip with which to label the keys.

We appreciate that the machine was lent to you for review by Comart, but we do feel most strongly that references to distributors should include ourselves.

Stuart Herman,
Trader Computers Ltd,
London NW8.

Compacted code

I READ with interest Bob Mackay's article on compacted text on page 147 of November's *Practical Computing*. Anyone who would like to read further on the subject should read my paper on text compression in the *Computer Journal*, Volume 4 (1981), page 324 which shows how to efficiently combine Huffman coding with dictionary coding in a single scheme.

Jack Pike,
Chawstone,
Bedfordshire.

Trade marks

A LARGE NUMBER of advertisers appear to be under the misapprehension that the trade mark "CP/M" is a registered trade mark. This is not the case — the mark is not a registered mark as defined by the Trade Marks Act, 1938. Moreover, while it may well be that "CP/M" is a registered mark according to U.S. law, none of *Practical Computing's* advertisers have indicated this to be so.

Section 60 of the act lays down that a £5 fine is the penalty upon summary conviction for representing that a mark is registered when in fact it is not, unless the representation makes it clear that the relevant registration is in accordance with the laws of some other country.

J P E Hooper,
Colchester,
Essex.

Machine code

IN THE JULY and October issues two readers reported an unusual bug in Pet Rem statements. The cause of this bug is that the Microsoft interpreter treats the shifted characters as tokenised Basic keywords.

This problem only occurs in Rem statements because in normal lines the interpreter automatically deletes shifted characters that appear outside quotes before the line is copied into the main memory. The characters in Rem statements are protectd from this.

A way round this problem is to put a quote character immediately after the Rem — the rest of the line will now list exactly as entered.

Robert Bannister's letter in the October issue raised many points that I should like to be able to comment on. Firstly manufacturers still make computers with built-in VDUs because they are increasingly required for the business market where their clarity and good ergonomic design are appreciated. Incidentally, most monochrone VDUs that I know of use a green phosphor that actually reduces eye strain.

If Mr Bannister has tried to write any complicated games, with many multi-character, moving objects, he will have had difficulty in making the program run fast enough because of the inherent slowness of interpreted high-level languages such as Apple Basic.

For this reason, many programmers prefer to write in

(continued on next page)

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

(continued from previous page)
machine code which in typical game applications is 100 to 1,000 times faster than Basic.

The amount of RAM taken up by a Space Invader program is of little importance unless it exceeds your RAM limitations, otherwise it merely gives a rough indication of the complexity of the program.

To say that machine code is "gibberish" indicates that Mr Bannister is as misinformed as someone who, knowing nothing of computers, says that Basic program is meaningless gibberish — a statement born of ignorance rather than logical reasoning.

Like it or not, computer games are attracting the most newcomers to computing and in particular these are the better arcade-style games such as Invaders or Pacman, which are by necessity written in machine code. These newcomers help to create competition between the manufacturers not only for the best computer but also the most attractively priced one. So we machine-code programmers are actually doing those who do not indulge a great service.

Finally if Mr Bannister wants a better Basic with long variable names, easier and better graphics, more user-friendly commands and better sound, perhaps he would like to try a BBC model B micro — not just because of it's British, but because it's the best.

If he wants more memory he could add a 3MHz 6502 card or an Z-80 card or a 16032 card.

P D Martin,
Manchester.

Speed freaks

CONTRARY TO the editorial in the July 1982 issue, Hermann Hauser has stated in July's *Which Micro?* that the 16032 processor does have advantages over eight-bit processors. To be precise, a speed advantage of 1,000 percent and size advantage of 35 percent. This is of course carefully written 16-bit code, not converted 8080.

P G Womack,
Kenninghall,
Norwich.

● Yes but only a floating-point maths program ran that much faster. Many users only care about processing words made up of eight-bit letters, and about maths rounded to two decimal places — that is, the pence column. A Ferrari is faster than a Mini and has more cc's in its engine, but these advantages are not very significant for normal use, such as pottering around town in the rush hour.

Graphics storage

IN MY ARTICLE on graphics storage in the November issue there is an error in part e of figure 11 on page 107. The caption should read:

Scans second block
Finds nothing
Stores 0 to show block is not used
No need to check lower levels.

Graham Kirby,
Knutsford,
Cheshire.

Monte Carlo

IT WAS NICE to see the article by William Hill advocating simulation methods but your readers should treat his integration method with some scepticism. While it is both simple and intuitive it is the most inefficient of the accepted Monte Carlo techniques.

To evaluate

$$I = \int_0^1 f(x)dx$$

a more efficient method is to generate n uniform random numbers on (0,1), say $u_1, u_2 \ldots u_n$, that is numbers lying between 0 and 1, and then calculate the estimate $\hat{I}$ of I where

$$\hat{I} = \frac{1}{n} \sum_{i=1}^{n} f(u_i)$$

The variance of this estimate is

$$\text{var}(\hat{I}) = \frac{1}{n} \text{var}(f)$$

which we might be able to determine using calculus but whch we can easily estimate as

$$s^2 = \left(\frac{1}{n-1}\right) \sum_{n=1}^{n} (f(u_i) - \hat{I})^2$$

using the same numbers $u_1, \ldots u_n$.

In the Applesoft listing you can see the coding is fairly simple. Notice if we have

$$\int_b^a f(x)dx$$

this can be written

$$(b-a)\int_0^1 f(y(b-a) + a)dy$$

Dr G J Janacek,
University of East Anglia,
Norwich.

Monte Carlo.

```
10  REM  MONTE-CARLO INTEGRATION
20  HOME
30  PRINT "THIS IS A MONTE-CARLO
     INTEGRATION"
40  PRINT "PROGRAM IN APPLESOFT"
50  PRINT "ENTER THE FUNCTION ON"

60  PRINT "LINE 130 "
70  PRINT "AS DEF FN F(X)=....."
80  INPUT "LOWER LIMIT OF INTEGRA
     TION=";A
90  INPUT "UPPER LIMIT OF INTEGRA
     TION=";B
100  INPUT "GIVE THE NUMBER OF RA
     NDOM NOS  ";N
110  PRINT "OK.. HERE GOES...."
120  PRINT "THERE MAY BE SOME DEL
     AY.."
130  DEF  FN F(X) =  EXP (X)
140 R = B - A: REM  RANGE OF INTE
     GRATION
150 S = 0
160  FOR I = 1 TO N
170 S = S +  FN F(R *  RND (1) +
     A)
180  NEXT
190 S = R * S:S = S / N
200  PRINT "OK ..RUN ENDS"
210  PRINT "FUCTION WAS GIVEN BY"
220  LIST 130: PRINT : PRINT
230  PRINT "NO POINTS=";N
240  PRINT "INTEGRAL=";S
250  END
```

```
JRUN
THIS IS A MONTE-CARLO INTEGRATION
PROGRAM IN APPLESOFT
ENTER THE FUNCTION ON
LINE 130
AS DEF FN F(X)=.....
LOWER LIMIT OF INTEGRATION=0
UPPER LIMIT OF INTEGRATION=1
GIVE THE NUMBER OF RANDOM NOS  100
OK.. HERE GOES....
THERE MAY BE SOME DELAY..
OK ..RUN ENDS
FUCTION WAS GIVEN BY

130  DEF  FN F(X) =  EXP (X)

NO POINTS=100
INTEGRAL=1.72262556
```

The Tube

HAVING RECENTLY read in your November issue, the article "Torch: a tool for the 80s?", I should like to point out an error of fact. The ULA-based inter-computer interface known as The Tube was designed and developed by Acorn Computers Ltd in Cambridge, and not by Torch as mentioned in the article.

J R Horton,
Acorn Computers Ltd,
Cambridge.

Oric's origins

THE ARTICLE on micros under £200 — December 1982 issue — gives the country of manufacture of the Oric as the U.K. According to a recent edition of the BBC TV's *The Money Programme* it is from Singapore. I hope you will correct this so that people who wish to buy a U.K. micro are not misinformed.

E Walsh,
Crowthorne,
Berkshire.

● The Oric uses a ULA which was designed in the U.K. and is made in the U.S. It uses PCBs from Singapore. However, the casing is U.K. made and the Oric is completed and assembled here. This, in our view, qualifies it as "U.K. made".

Vic-20 errors

"BRING TRUTH HOME, to error-stricken souls" said E Burr in 1871.

The Vic-20 stores numbers using five bytes. The first byte is the binary exponent plus 129. The remaining four bytes give the binary mantissa. As the first bit of the mantissa is 1 it is not stored but understood, instead

(continued on page 13)

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(continued from page 8)

bit 7 of byte 2 is used to indicate the sign of the number.

For example, 0.5 is stored as

128,0,0,0,0.

while −0.5 is stored as

128,128,0,0,0.

The number 10, which is 1010 binary, is stored as

132,32,0,0,0.

To determine how a number is stored you can Peek in the following way, by typing

```
NEW:CLR (then press Return)
X = (type your number and press
  Return)
FOR I = 5 TO 9:PRINT PEEK
  (PEEK(44)*256 + 1); :NEXT I
```

Pressing Return will then give the desired result.

Now for the errors. The number 1 + .5↑24 is stored as

129,0,0,0,128.

However, the same number written as 2*(.5 + .5↑25) is stored as

129,0,0,64

Similars problems occur with number of the form 2*(.5 +.5↑B) where 25 ≦ B ≦ 31.

There is no problem if B < 25 or B = 32. Similarly, there is no problem if you do the multiplication the other way round, that is if you look at (.5 +.5↑B)*2. There is no problem if the third and fourth byte are both zero.

You can check this either by Peeking or by Running the following:

```
10 FOR I = 20 TO 32
20 PRINT (2*(.5 + .5↑I) − 1)*2↑I;
30 NEXT I
```

The answer should be 2 in each case, but it isn't! You can also try one of the following in line 20:

```
(4*(3/4 + .5↑I) − 3)*2↑(I − 1)
(8*(7/8 + .5↑I) − 7)*2↑(I − 2)
(16*(15/16 + .5↑I) − 15)*
2↑(I-3)
.....
(256*(255/256 + .5↑I) − 255)*2↑
 (I − 7)
```

Again, the answer should be 2 in each case, but it isn't.

There are many other examples. Just make sure that the third and fourth byte are both zero and multiply by a power of 2 on the left. These bugs have been found on several different Vics. Is there a Vic without these errors?

Czes Kosniowski,
School of Mathematics,
University of Newcastle upon Tyne.

Paper Tiger

I HAD THE SAME problem as P E Roberts — June 1982 Issue, page 45 — with a Paper Tiger outputting garbage on long listings when driven from an Apple II with the serial interface card.

One way of looking at it is that the Apple dumps characters faster than the Tiger can print them, and the buffer is filled by even medium-length programs, thus causing the garbage. One way to cure this without any hardware modifications is to slow the rate that characters are transferred to that at which they can be printed.

In Basic I found the best and simplest way was to use the Speed instruction which introduces pauses between characters as they are printed to the screen or printer. To list a long program simply type in:

```
PR#1
SPEED = 190
LIST
SPEED = 255
PR#0
```

I have found that a Speed of 190 — it needs some experimentation for previous character sizes — works with all my programs. Even a 16-page listing comes out OK.

Andrew Gordon,
Brechin,
Angus.

Cool Atom

I EXPERIENCED the same overheating problem with my Acorn Atom as P Sharma — Feedback, December 1982. After several hours work, my Atom loses byte indirection. The Atom is one of the few computers without provision for ventilation, and though there may well be another cause for the fault, this one is easily corrected.

First turn the computer upside down and undo the two screws on the bottom. Open the case to expose the aluminium-coloured heat sink. Check that the screw-headed bolts securing the heat sink are tight. If they have slackened, tightening will restore the heat transfer and this alone may prove sufficient remedy.

However, once you have opened the case it may be worth making further improvements. Using a hand-drill and hacksaw, cut out a neat rectangle in the back wall of the computer case opposite the heat sink. The Atom case is extremely strong and will not miss the material. Drill ventilation holes in the base

(continued on page 15)

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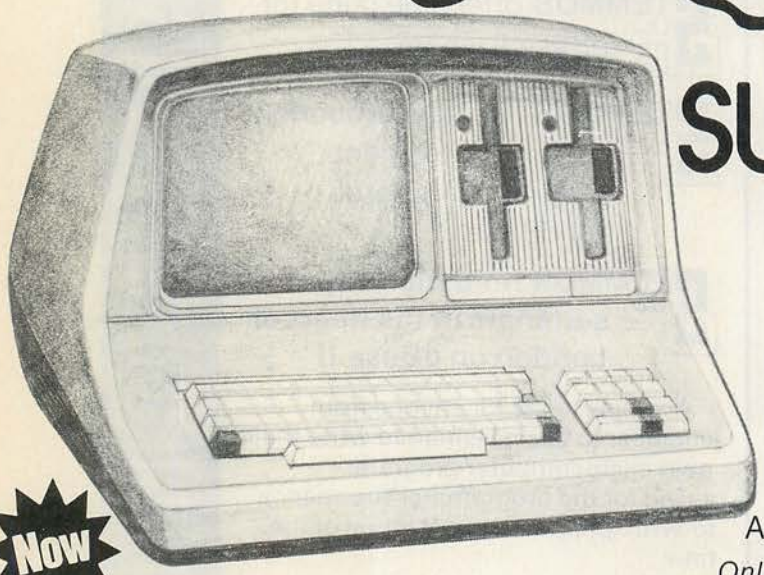

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(continued from page 13)
of the case under the heat sink.

If you then paint the outward-facing side of the heat sink with heat-resisting black paint, heat will now be radiated out of the case through the rectangle while cool air is drawn in through the vents in the base. My Atom has performed reliably for very long periods since undergoing this mild surgery.

Trevor Whyatt,
Gillingham,
Kent.

Software piracy

I WOULD LIKE to add a comment to your December editorial on protection from pirates. As a dealer it is my objective to marry computer hardware and a particular software package to meet a client's requirements. Computer publications are full of vertical market packages: some good, some not so good, and all with their own individual characteristics.

From a dealer's point of view it has become increasingly difficult to assess these packages because the majority of software houses insist on retaining their products until sold, due to the fear of piracy. This attitude, however valid, has to be harmful to both themselves and the industry in general. Dealers are in business to sell software not buy it.

It is correct to believe that at the top end of the market — £200 and above — piracy can be contained in the area of support; all our clients are required to register either with us or the software house concerned. I do not, however, agree that the users have the right to modify code to suit their requirements. Customising should, if applicable, be built into the software and permanent changes made, at a cost, by the software house. If the concern over piracy was reduced such costs could be kept to a minimum.

Frank Faulkner,
RCB Ltd.
Abergele,
Clwyd.

● Some people favour the turnkey approach to computing: they are not interested in how things work, they just want them to do a job. Other people like to "customise" their computer by changing chips, addings bits on and taking bits off. Where would Apple and Pet be today if enthusiasts had not taken this approach? And if it is done with hardware and firmware, it is going to be done with software.

Wordpro points

AS ONE who has been using Wordpro and other programs for nearly three years as a means of introducing students to word processing I was, of course, interested by the articles about it in the October and November 1982 issues of *Practical Computing*. Like David Oborne I consider Wordpro to be a very good and powerful package and it equals or is superior to a number of dedicated word processors. It is a pity that the two articles contain some inaccuracies to the detriment of Wordpro.

The statements "Wordpro I is a tape-based system whereas the others are disc based. All levels of Wordpro require at least 32K RAM" are both incorrect. Wordpro II can be run with either tape or disc and means are available for conversion of programs from tape to disc if a user upgrades. Up to Wordpro II can be run on a minimum of 16K memory. More memory gives more working area but Wordpro II is a good, cheap starter for teaching establishments in view of its upgrading capabilities.

The centring commands are cn1 and cn0 not cel and ce0 as stated.

The use of the backslash facility and the visibility of the directory when calling files are very useful assets of Wordpro. However, if the backslash facility is not used there is no risk of corrupting other files. Incorrect entry of the file name merely creates a new file under the incorrect file name without scratching the old file it was intended to replace.

The use of the comment line to hide formatting commands is not necessary in continuation files of a multiple-file document, providing each file starts a new page. If it doesn't start a new page the page lengths go wrong. Inclusion of the p# command ensures that the section of the document starts always at the correct page. Incidentally, p#1 on the first document also ensures that multiple outputs number the first page as page 1.

J K Burge,
Caterham,
Surrey.

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Two's company on 16-bit Televideo

WHY IS the TeleSystem II named the II when it is Televideo's first micro to run Unix? Answer: because it is supplied, as standard, with two CRTs. The standard machine is a personal computer designed to be personal to two people — such as a manager and his or her secretary.

As befits a business micro, the standard TeleSystem II also comes with 512K of RAM, a 40Mbyte hard disc, 17.5Mbyte tape drive for back-up, and the Unix operating system. In the U.S. the price is under $14,000.

The TeleSystem II uses the Motorola 68000 chip, like the Fortune 32:16, Corvus Concept and Sage II microcomputers. Televideo's first 16-bit machine, the TS-1600, used the Intel 8088. The TeleSystem II was first shown at Comdex in Las Vegas, but is not expected to reach the U.K. for another six to nine months.

Contact Colt Computer Systems, Fairfield Works, Fairfields Road, Hounslow, Middlesex TW13 1YU. Telephone: 01-577 2686.

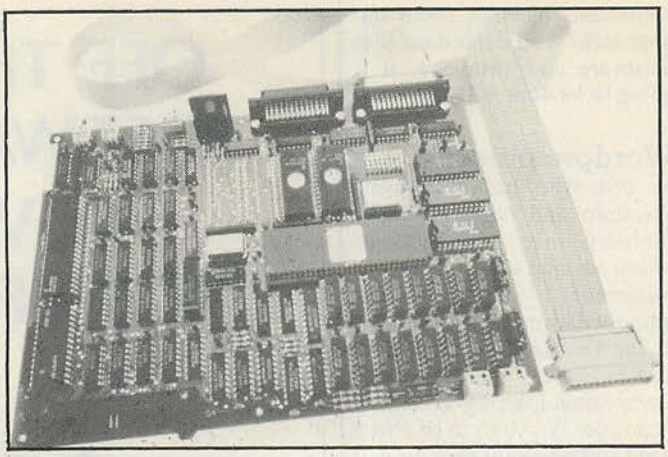
Portable has 8Mbyte on disc

THE COMPUCASE is a briefcase-sized portable micro with 8Mbyte of disc storage, full-size ASCII keyboard, 80-column printer and a display screen. The briefcase is only 13in. by 18in. by 5.5in.

The Compucase uses two eight-bit Intel 8085AH-2 processors, and has 64K of RAM. The display is 40 characters by 12

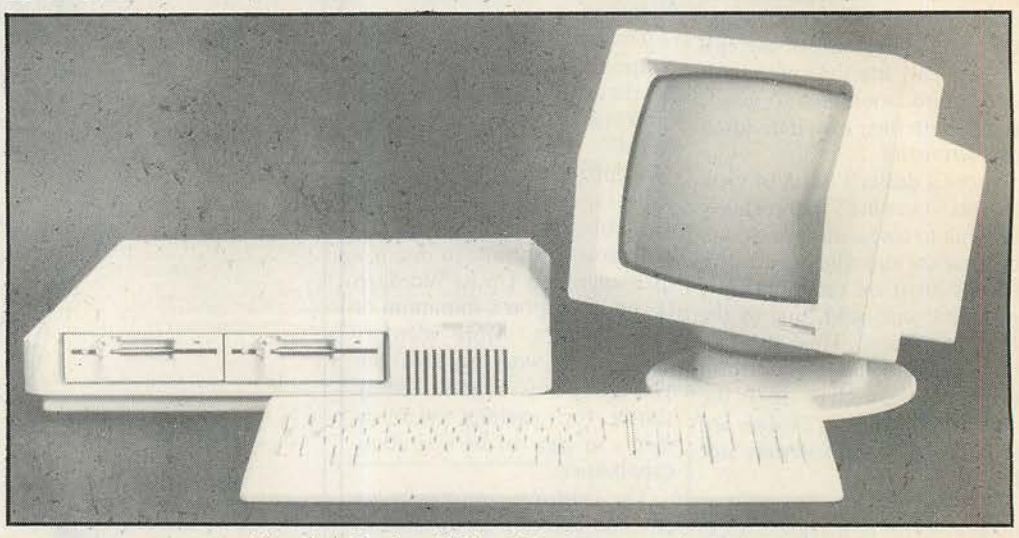
lines, uses gas-plasma technology, and is built into the lid of the case. The price is about £2,800.

Contact Advanced Software Technology. Telephone: 01-330 0764.



The Profi Kit 2 is a 16-bit single-board computer using the Motoroala 68000 processor. Designed by Force in Germany, the board is an upgrade of the Profi Kit 1. It includes 128K of RAM and serial, parallel and cassette ports. Profi Kit 2 costs £499 plus VAT. Contact Microsystem Services, PO Box 37, Lincoln Road, Cressex Industrial Estate, High Wycombe, Buckinghamshire HP12 3XJ. Telephone: (0494) 41661.

U.K.-built micro range to start with IBM look-alike



THIS NICE-LOOKING machine is the FX-20, one of a range of IBM-compatible 16-bit systems. It will retail at a low £1,800, and will be available in April 1983, according to the manufacturer, Future Computers.

The processor used by the FX-20 is the ubiquitous Intel 8088, as found in the Sirius and IBM machines. The FX-20 is both software and hardware compatible with the IBM PC, and should be able to take the full range of plug-in boards which are being manufactured for the IBM by Independent suppliers.

The very reasonable price of the FX-20 includes two 5.25in. floppy drives totalling 1.6Mbyte, 128K of RAM, the CP/M-86 operating system as standard, and the Spellstar word-processing package thrown in free. MS-DOS will be available as an option immediately. An eight-bit CP/M emulator, to enable users to run standard CP/M software, as well as the Unix look-alike operating system Xenix will be following soon.

According to Future Computers' Managing Director Brian Jackson, not having the IBM name means the company has to offer the user something extra in order to compete. Apart from the lower price, the FX-20 will run a claimed 60 percent faster, as it uses high-speed memory and runs the 8088 at a fast 8-MHz clock rate. Fully half the on-board ROM is taken up with diagnostic software, reflecting a welcome realisation that a business machine must be reliable and easy to maintain.

Good looks and good design are where 16-bit machines score over their generally older eight-bit rivals, whatever one thinks of the claims of much greater operating speeds and throughput. Starting from scratch, with modern technology and probably much more money than the early microcomputer pioneers whose machines still dominate the market, the design team has come up with a machine which should be pleasant to use in an office environment.

The screen, which can be tilted in any direction, displays 25 lines of 80 characters using a high-definition 16-by-10 dot matrix for each character. Alternative character founts can be user generated.

The FX-20 forms part of a range of machines which will appear during 1983, including the 50Mbyte FX-50 hard-disc system. All machines come with a local area network interface as standard.

Some £400,000 of the funding for the range comes from the British Technology Group, which holds 15 percent of the company's equity. Distributors will include the Encotel chain, which is part of the same group. Maintenance arrangements are currently being negotiated with two national third-party maintenance companies.

Contact Future Computers Ltd, PO Box 306, Purley, Surrey. Telephone: 01-689 4341.

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APL has a reputation for being a Boffin's language, but Helen who learned APL through PPL, is a Business Analyst whose needs are strictly practical. She solves her modelling problems almost as soon as she can formulate them. In fact, the structure of PPL is such that it actually assists her thinking!

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Keyboard: 83 keys, 6ft cord attaches to main cabinet*, 10 function keys*, 10-key numeric pad*, tactile feedback
Monochrome display: High-resolution (720h x 350v)*, 80 characters x 25 lines, upper and lower case, green phosphor screen*.
Colour/Graphic: *Text mode* – 16 colours*, 256 characters and symbols in ROM*
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Card boosts Vic-20 to 80 columns

COMMODORE's new Stack card provides a 40- or 80-column format with the standard Vic-20. It costs £115 including VAT, but

should appeal to existing Vic owners who want to do word processing but wish they owned the Commodore 64 instead.

Contact Commodore U.K. or go direct to Stack Computer Services, 290-298 Derby Road, Bootle, Liverpool L20 8LN.

DCP Interspec

IN DECEMBER we published news of this interfacing unit for the ZX Spectrum. Unfortunately a couple of misprints crept into the article, and the company name and address appeared incorrectly. Cheques must be made out to DCP Microdevelopments Ltd or the bank will not cash them.

Contact DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX. Telephone (0603) 712482.

Torch now approved by BT for direct link-up to Telex

Software director Ray Anderson developed the software-by-phone system.

THE TORCH was the first and is still the only computer to be approved by British Telecom for direct connection to the public switched phone system. Now is has also been approved for connection via a Hasler Modem to the Telex network. People using punched-tape please note that with a Torch you can download from disc.

Torch has also developed a system for delivering software by telephone. This is easy enough, given a Torch at each end of the line: the problem is to prevent free access to anyone on the Torchmail network.

The solution takes the form of a scrambler program coded by the customer's credit-card number. The scrambler will only unlock the program against the number, and it becomes a simple matter to bill the software to the customer's credit-card account.

Contact Torch Computers Ltd, Abberley House, Great Shelford, Cambridge. Telephone: Cambridge (0223) 841000.

Anglo American Computing Services has set up a mobile computer unit which will dash to the aid of firms who face ruin as a result of computer disaster. The cost is from £2,000 a year, and hardware options include Hewlett-Packard 3000, Vax and PDP, Digital systems and IBM machines.

Contact Anglo American Software, Anglo American House, Main Street, Shenstone, Staffordshire WS14 0FN. Telephone: (0543) 481042. There are no plans to equip men on bicycles to rush out and deal with disasters on Sinclair computers, as far as we know.

Inmos promotes new high-level language

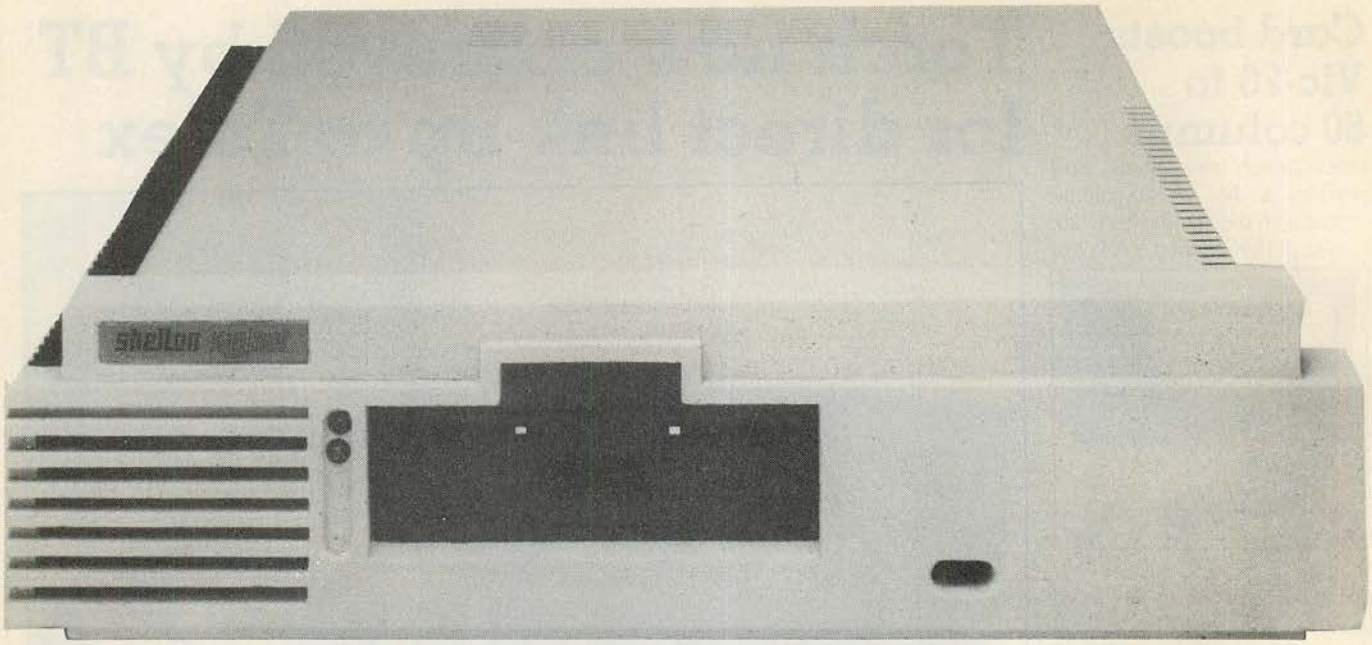
CHIP MAKER Inmos has launched a new computer language which has been specially designed for the complex multi-processor systems of the future. It has been developed with Professor Hoard, Director of the Programming Research Group at Oxford University, and is orientated for interactive use.

It has been named Occam — Inmos spells it with a small "o" — after the 14th-century philosopher William of Occam, who invented Occam's Razor. "Entia non sunt multiplicanda praeter necessitatum," he wrote, In modern parlance this has been replaced by KISS, or Keep It Simple, Stupid.

The basic data type in Occam is the word, which can stand for a number, character, truth value or bit pattern, and takes a range of logical and arithmetic operators. Program sections are combined using four constructors: sequence, parallel, conditional and alternative.

Immos has launched an Occam Evaluation kit consisting of a portable compiler and editor built on top of Softech's UCSD p-system, v.4, which generates p-code. The language and compiler manuals, installation instructions and sample programs are all supplied for £100. Disc formats are available to suit Apple II, Sirius 1 and Victor 9000, IBM PC and other computers.

Contact Inmos, Whitefriars, Lewins Mead, Bristol BS1 2NP. Telephone: (0272) 290861.



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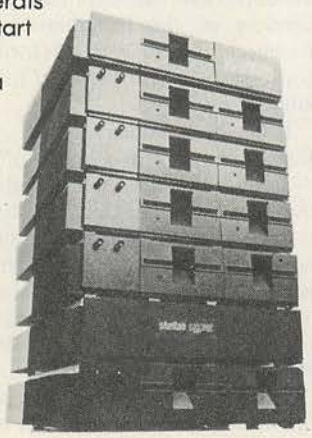

Because the Sig/net operating system is CP/M compatible, it enables you to provide bespoke software easily, in addition to the very wide range of proven business software already available on CP/M.

The successful British manufacturer, Shelton Instruments, is undertaking a programme of advertising, PR and exhibitions. Enquiries generated in the South-East from these promotional activities are passed on to the dealers, through DPLC. Comprehensive product brochures are also available.

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Creative Sanyo

SANYO DID NOT announce the MBC-4050 at Compec, but it was there on the stand. Called the Creative Comuter, it features an Intel 8086 microprocessor, 12K of ROM and 128K of RAM, plus two built-in floppy-disc drives with 600K of storage each.

The detached keyboard has 15 function keys, five cursor-control keys, and an 18-key numeric keypad. The monochrome VDU gives an 80-column by 25-line display. The price is expected to be about the same as for the Sirius 1.

Contact Logitek, Logitek House, Bradley Lane, Standish, Greater Manchester. Telephone: (0257) 426644.

Micro stands together

AT LAST someone has brought out a range of adaptable stands suitable for microcomputers. The standard models are 24in. or 30in. deep, and 26in. or 38in. high. An optional shelf is available for a VDU or printer. The stands are supplied packed flat for self assembly. Prices start at only £38 plus VAT.

Contact Prototype Development Systems Ltd, Enterprise House, 44-46 Terrace Road, Walton-on-Thames, Surrey KT12 2SD. Telephone: (09322) 45670.

Atari in business

SILICON CHIP of Slough claims to have produced the world's first business software package exclusively for the Atari 800 micro. Does this mean the various American packages were originally written for the Apple then converted?

The Chipsoft range is comprehensive and includes five modules: stock control, sales ledger, purchase ledger, mail shot and PAYE. They are all written in Microsoft Basic, not Atari Basic. Each module costs just under £150, and this includes VAT.

Hardware requirements are a 48K 800 plus two 810 disc drives, the 850 interface, a printer and Atari's Microsoft Basic on disc. Silicon Chip prices the whole lot — including software — at £2,054.57 plus VAT, which is not bad for a business system.

VisiCalc is also available for the Atari, plus a couple of databases and numerous word processors with mail merge

(continued on next page)

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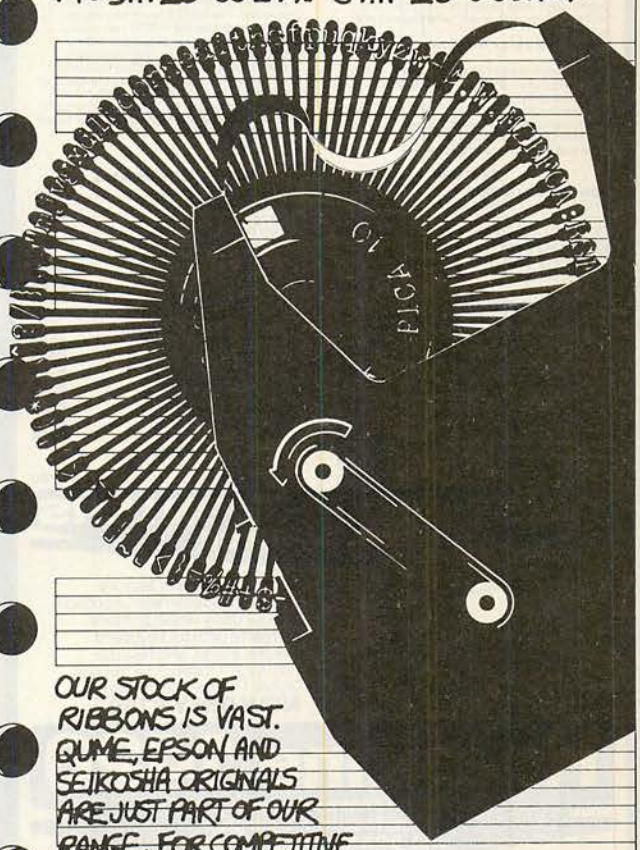

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DIGITAL WS78 SERIES WORD PROCESSOR

Specification
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RX01 diskette storage subsystem.
PDP-8 control processor.
Diablo 1345 letter quality printer producing 540 words per minute with wheeled storage cabinet.
Bi-directional tractor feed fitted as standard.

Features
- Inexpensive stand-alone text editing
- Simple to use—prompts the operator automatically
- Letter quality printer with choice of print wheels
- Simultaneous editing and printing
- Powerful list processing package
- Flexible communications capability

System performance
Digital's WS78 word/data processing system is a powerful stand-alone, video display word processor. The WPS-8 word processing software provides the WS78 user with a sophisticated yet easy to use text editing capability. Operating the video terminal is similar to using a standard office typewriter. The 'Menu Based' system allows the operator to choose from an extensive, clearly listed range of options and the automatic prompting features help the operator to learn how to use the system with only minimal training.

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(contined from previous page)

facilities.

Contact Silicon Chip, 302 High Street, Slough. Telephone: (0753) 70639.

Atari has just made yet another cut in the price of the 800, presumably in response to our request — January issue, page 156. The 800 now costs £399

Preparing for power failure

SUDDEN SURGES and spikes in mains voltage can corrupt data or have worse effects on micro-

computers. The Microguard EPU-1000 is a new addition to a range of units which provide constant voltages and power back-up in case of mains failure.

Contact Microguard, 24 Foregate Street, Worcester WR1 1DN. Telephone: (0905-21541.

Friendly Optim

AT A TIME when most micros are called the SQRX-10041P or something similar — to distinguish them from home micros with names like Oric, Lynx and Spectrum — Optim Computers has given its machine a friendly name. However, the Amigo is a Z-80A micro with 64K RAM and CP/M 2.2 — an operating system not widely admired for user friendliness.

The Amigo is a smart, four-box system consisting of a central unit with display screen, a detached keyboard, dual floppy-disc drives and printer.

The display gives 80 characters by 25 lines on a 12in. green screen, and is controlled by a separate 6502 processor with 44K of display memory. Bit-mapped graphics are available with a resolution of 640 by 300 pixels.

The keyboard is Selectric style with 83 keys, including a numeric keypad and 27 programmable function keys. The 8in. floppies offer 400K of formatted storage. Double-density floppies and a 5Mbyte hard disc are optional extras.

The printer supplied is an 80-column Epson MX-80 III dot-matrix model, but other options are available.

Contact Optim Computers, Lawford House, Harrow Road, London W10. Telephone: 01-969 9768.

Microfinesse

MICROFINESSE is now available for the IBM Personal Computer running under the UCSD p-system. Microfinesse is a so-called decision-support program which runs on a wide range of mini and mainframe computers. While it is principally a financial-modelling program it can be applied in a number of other areas. It is aimed at financial executives and costs £550.

Contact Ferrari Software Ltd, 683 Armdale Road, Feltham, Middlesex TW14 OLW. Telephone: 01-751 5791.

Could anything be Finar?

FINAR is a financial-planning package used by over 100 corporations on PDP-11 and Vax minicomputers. Now a micro version has been launched, called Microfinar. It features such delights as sensitivity analysis and goal seeking, graphics and a separate report writer.

Early customers include United Biscuits, with an Altos-based package, and a Fisons and Boots company called FBC with a Systime 500 set-up.

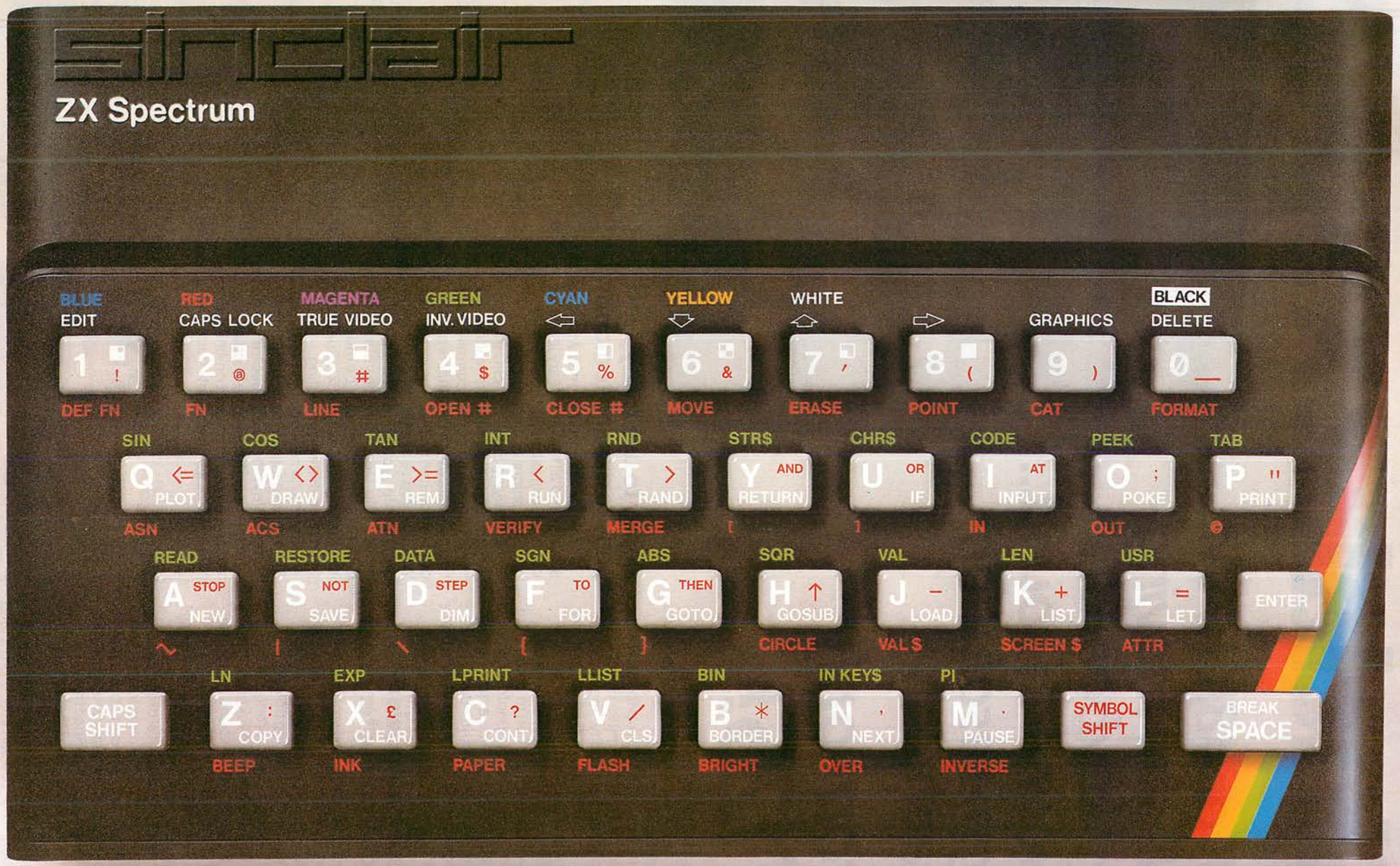
Contact Corporate Modelling Consultants, Friendly House, 21-24 Chiswell Street, London EC1Y 4UD. Telephone: 01-628 4107.

Haywood 9000

WELL-PROVEN Z-80 technology is at the heart of Haywood's new British-made computer, the 9000 Composite. It has 64K of RAM, two built-in floppy-disc drives with 320K of storage each, and a 12in. monochrome screen.

The detached keyboard has 19 function keys and an 11-key numeric pad; or Haywood can supply versions with up to 34 function keys, including one configured for WordStar.

Contact Haywood Electronics, Electron House, Leeway Close, Hatch End, Pinner, Middlesex. Telephone: 01-428 0111.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ZX Spectrum
BLUE EDIT 1 ! DEF FN
RED CAPS LOCK 2 @ FN
MAGENTA TRUE VIDEO 3 # LINE
GREEN INV. VIDEO 4 $ OPEN #
CYAN ⇦ 5 % CLOSE #
YELLOW ⇩ 6 & MOVE
WHITE ⇧ 7 ' ERASE
⇨ 8 (POINT
GRAPHICS 9) CAT
BLACK DELETE 0 _ FORMAT
SIN Q <= PLOT ASN
COS W <> DRAW ACS
TAN E >= REM ATN
INT R < RUN VERIFY
RND T > RAND MERGE
STR$ Y AND RETURN [
CHR$ U OR IF]
CODE I AT INPUT IN
PEEK O ; POKE OUT
TAB P " PRINT ©
READ A STOP NEW ~
RESTORE S NOT SAVE |
DATA D STEP DIM \
SGN F TO FOR {
ABS G THEN GOTO }
SQR H ↑ GOSUB CIRCLE
VAL J − LOAD VAL $
LEN K + LIST SCREEN $
USR L = LET ATTR
ENTER
CAPS SHIFT
LN Z : COPY BEEP
EXP X £ CLEAR INK
LPRINT C ? CONT PAPER
LLIST V / CLS FLASH
BIN B * BORDER BRIGHT
IN KEY$ N , NEXT OVER
PI M . PAUSE INVERSE
SYMBOL SHIFT
BREAK SPACE

Sinclair ZX Spect

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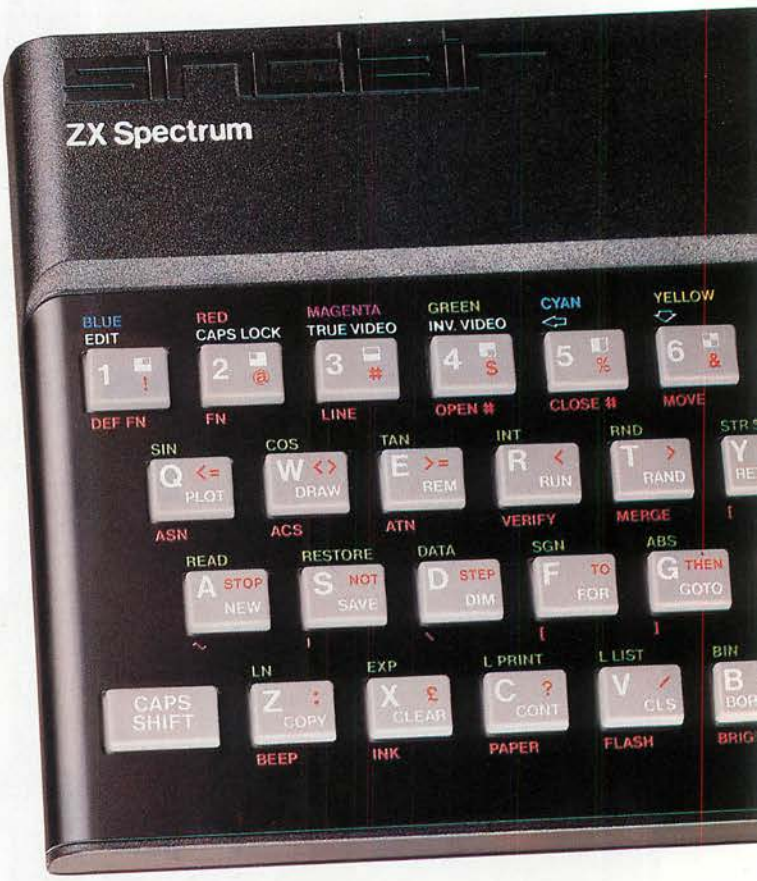

First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power–personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.

Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variabl pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

Spectrum software on ssettes – available now

The Spectrum software library is ving every day. Subjects include es, education, and business/ sehold management. Flight ulation...Chess...Planetoids... ory...Inventions...VU-CALC...VU-3D ub Record Controller...there is ething for everyone. And they all e full use of the Spectrum's colour, d, and graphics capabilities. You'll ive a detailed catalogue with your ctrum.

Expansion Module

This module incorporates the three tions of Microdrive controller, local network, and RS232 interface. nect it to your Spectrum and you can rol up to eight Microdrives, municate with other computers, and a wide range of printers. The potential is enormous, and the ule will be available in the early part 83 for around £30.

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lair Research Ltd, Stanhope Road, berley, Surrey GU15 3PS. Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £ _____

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

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PRC 902

FREEPOST – no stamp needed. **Prices apply to UK only.** **Export prices on application.**

Sinclair ZX Spectrum–technical data.

Dimensions

Width	233 mm
Depth	144 mm
Height	30 mm

CPU / memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive–or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, –, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to 9½ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a$ (x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).
String – A$ to Z$.
FOR-NEXT loops – A-Z.
Numeric arrays – A-Z.
String arrays – A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY. ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

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ZX Spectrum

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

• Circle No. 116

One-day VisiCalc

Jack Schofield tries out one of MicroMark's courses

BACK IN THE OLD DAYS — say 1978 or 1979 — most microcomputers were bought by enthusiasts. They were (a) amazed that they could own computer at all, and (b) astonished that they could make it do anything useful. The fact that many programs were awful and the documentation even worse did not disconcert these enthusiasts. It was all part of the challenge, and how we loved it.

Nowadays microcomputers are bought by real people who have the idea — encouraged by the media and the Government — that all they have to do is plug the thing in and most of their problems will be solved. Good dealers need to disabuse their customers of this myth, and good dealers know they have to train their customers to make the best use of the products.

Customers, however, are often short-sighted, and tend to buy their micros from the dealer offering the lowest price. They will even buy goods they have never seen, from people they don't know, by mail! Unfortunately, training takes time, and time is money.

Training investment

As a result, many good dealers now offer training, and charge for it. Others, like MicroMark, organise formal courses on a professional basis. This has two advantages. People who bought discount equipment can get the training they need — ironically, by spending the money they thought was saved.

MicroMark started in 1979 as a specialist Apple dealer, though the firm now sells the IBM Personal Computer too. For some of the reasons already described, its own training division was launched last summer and by the end of 1982 had run over 30 courses. MicroMark offers three different courses, each lasting one day:

Learn VisiCalc — for beginners
Using VisiCalc — for people familiar with the package
Beyond VisiCalc — covers extensions such as Visiplot, -term and -trend.

There is no obligation to attend all three days, though obviously some would find it an advantage.

I went on the first course, conducted by Philip Stokes at a London hotel. The day began with coffee, biscuits and introuductions at 9 am, with the formal part of the course starting at 9.30. On this occasion there were only seven students, plus the lecturer and David Flook from MicroMark. We shared five Apple IIs, so there were two people per machine, three is MicroMark's limit.

The tuition alternated between Philip Stokes' lecturing, with all the students' Apples slaved to his, and hands-on

experience. We started with keyboard exercises, which were explained using charts and an overhead projector before being run through on the VDU.

Then we were given an exercise sheet to follow, and allowed control of the micros to actually try it. The two tutors came round the class to make sure we managed. In this way we covered the VisiCalc commands: it took all morning, not including the coffee break, and it still felt fast.

An excellent lunch, with wine, was followed by an afternoon session devoted to VisiCalc functions and applications. Functions included error reporting, look-up tables, Dif files and datagrams. Applications included inventory, bill of materials, cash flow, manufacturing plans, estimating and scheduling. The final session allowed time for a short personal experiment — starting a model from scratch — before the course ended after 5 pm.

At the start of the course you are given a 40-page handbook. Most of it is white space, but it does include all the charts and printouts of the overhead slide projections used in the lectures. They make it fairly easy to remind yourself of what you should have learned, and so find the piece of information you need.

You are also given an Apple disc of the 19 models and files used in the course. It provides another useful reminder of the course later, when you are trying to construct you own models. You can also use it as a source of ideas. I found this one of the most interesting parts of the course — not being one of the 300,000 or so people who actually own a copy, I had never realised just how useful and versatile VisiCalc could be.

Certainly it is possible to learn how to use VisiCalc from the manual, especially if you are already familiar with the Apple — or at least, a computer keyboard. But is it worth spending money on a course? The MicroMark courses cost £112 plus VAT for single days, which seems average.

Taking a course certainly does have advantages. First, it reduces the time-wasting you get with any new software package and computer. Recently I spent 15 minutes trying to follow the screen instruction "Press <Esc> to continue" because there was no <Esc> on the keyboard. The demo disc even had a section on the Esc key without saying which it was. Naturally it was not in the index of the manual. Multiply this confusion, and you can waste a lot of time learning how to use a micro.

Second, going on a course establishes the time slot necessary to learn at least the rudiments of the package. Let's face it, no business user has the time to learn how to use software properly, and no time to read the manual. In theory it is possible to devote a day in the office to learning the basics, but then the phone rings all day, and all kinds of crises come up which "must" be dealt with. Being shut away in a hotel where no one can reach you, and where you can spend all day learning one thing, is a much more efficient way of doing it.

Pool of experts

Third, it is useful to be able to draw on othe people's expertise. Almost everyone could learn at least something, even from the beginner's course. For example, I had not appreciated the power of the Datagram technique, where you can construct macros of several instructions — such as the column replication and multiplication needed to do a consolidated balance — then save the routine and apply it like a subroutine when needed.

In the end a course cannot replace studying the manual, and it has disadvantages compared to individual on-the-job training.

Certainly I am glad I had the chance to go on MicroMark's VisiCalc course. Perhaps the best thing I can say about it is that it persuaded me I should buy VisiCalc — though I will not want the Apple version, so the work disc will not be much use.

I shall also look with a new interest at details of the many other courses available. Picking a good course is probably the most difficult problem of all. Word-of-mouth recommendations must be the best way of deciding, though it should inspire confidence if a course has been run a number of times already. Most of the bugs should have been sorted out.

Small numbers of people and real hands-on experience are also important factors. MicroMark's own ceilings of three people per work station, one tutor per two work stations and eight work stations per course seem reasonable. You can contact MicroMark's Training Division at Ravenscroft Road, Henley, Oxfordshire RG9 2DH. Telephone: (04912) 77926 or 77085.

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*****THE NEW DBMS III (series III of the world's first 'task-robot-programs')*****

*****FEATURES*****

Mbasic & word-star compatible
1400 character record sizes
mathematical scratchpad
record relational indexes
translateable to any language
User-defineable reporting
field protection/classification
sorts 'alpha or numeric' any window
either-or. same as. greater. smaller

32000 records per filename
20 main/200 sub fields per record
field and record related formulae
'Jump-to' any of 32000 records per file
random/binary/key/multiple field search
'if-then' questioning
file protection/password entry
speed of 500 records per 20 seconds
range match. not match. integer match

12 online file architectures
240 fields using cross-referencing
cross-record calculations
'Jump-to' any record in 12 files
User-defineable files/field words/sizes
endless 'either-or' matching
formulate/recall on selection criteria
12 interrogation question types
short filing output/audit trails

ONE OF THOUSANDS OF DIFFERENT TASKS ON WHICH THIS PROGRAM MIGHT BE EMPLOYED

DMS'S MACROS WORK FROM THE MOMENT YOU INSERT THE 'TASK DISK' IN THE COMPUTER DRIVE

Simply design your file, give its fields your words, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulate any task you wish the program to fulfill, the task is stored as a macro. Take a copy of the program on another 'task disk' and from then on, the task disk will function without a single key-stroke. Think of a number of such 'task disks' such as "stock-re-order reports"; "stock-valuation reports"; "sale-mail-shots"; "production-process-analysis"; "patient history analysis"; "research-analysis"; "budgetting" "purchase/sales-analysis"; "personell-file-analysis"; "vehicle-location control"; "librarian analysis"; "plus more?"

Previous issues showed examples of 'employees-short-list', 'garage stock re-order', 'sales analysis' 'librarian's list' here is an example of a hospital's patient index and some reports it might generate.

The record may look like this:
1-record number (23)
2-patient (John Smythe)
3-date of birth (01.05.45)
4-date last visit (12.02.82)
5-symptom (epigastrium ache)
7-diagnosis (peptic ulcer)
8-test type (barium meal)
9-prescription (100 mg carbenoxolone sodium 3 * daily)
10-effect/other (minor improvement/test for surgical treatment)

One report might be: select ?? all records where patients have had symptoms of 'epigastrium ache' associated with nausea or vomiting not diagnosed as peptic ulcer. Print a list of those where there were barium tests made and the effect.

Another report might be: select ?? all records in the file where the where diagnosis of ailment was peptic ulcer or duodenal ulcer, and then where the treatment was carbenoxolone sodium and in the first instance list those where there was no improvement; after which list those where there was an improvement..

DBMS II (WITHOUT MACROS) AND DBMS III ARE FULLY IMPLEMENTED UNDER CPM-86 (tm) and MS-DOS (tm) ie: (SIRIUS/VICTOR/IBM)
DBMS II IS 395.00 (or 250.00 by mail order ex. training). DBMS III is 575.00 (or 295.00 by mail order ex. training)

TELEPHONES: 01-636 8210 : 01-631 4818 : TLX: 892031 TWCG (BOSTON 94-0890)

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All computer prices include mbasic as standard.
All prices marked £ are 8/16 bit machines.

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and get completely ****FREE****

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****total value 1480.00****

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NOTE: Corvus drives with multiplexor may network sirius.. Superbrain.. Concept.. PET.. Victor.. IBM..

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Software formats on all micros in our hardware list.
All prices marked £ are available 8/16 bit formats.

TERMS & ETC

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Tel: 01-636 8210: 01-631 4818: tlx 892031 twc g
Boston office tlx 94-0890
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Please call in only by prior appointment.

G80/86 SOFTWARE

Fully implemented on MS-DOS, CPM 2.2 and CPM 86 (tm)

Works on IBM, Sirius and Victor 9000 and all micro-computers in our price list

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Each module is a set of 'tast disks' designed for minimal learning curve. This software derives from modules of 'DBMS III' and runs reports without your secretary having to touch a single key.

Consider the advantages in these features. The user manual is contained in FIVE pages. All reports are generated by robot functions. Reliability tested (benchtest PCW June). Works in a network multi-user environment. Fast easy data entry. Files are re-organised and sorted automatically.

Produced by the same people that originated 'BUSiness', 'DBMS II', 'DB-CALC', 'AUTOLOAD AND RECOVER' 'ETC' and sold successfully over the past five years.

Also see our advertisement next page, the software above comes free with a system purchase (excluding items marked ** and DBMS III).

The G80/86 networks

Based upon one hard disk and multiplexor module the G80/86 networks feature full network sharing of data resources by adding different stations that may be as various as Sirius/Victor 9000/IBMSuperbrain/Pet/N' star/Sanyo. The low-cost start-up of a network could be simply

1 hard-disk of 5 mgbytes	1 multiplexor	1-2 stations
2100.00	695.00	from 795.00

We also have a special 'spooler module' as well as software controllable port expanders and modems for output to telephones, printers, and screens so that a number of terminals may share the resources of one printer, as well as be able to send files over the telephone at any time (day/night) to both store on the hard disk and print out as well.

Imagine a terminal at a remote site, being able to send/receive its files to/from the main network's hard disk/printer overnight to be examined and processed the next day.

The commands are literal English. Like: (send file 'ledger' to port 'B' (the modem) at 11.30)

only from **G. W. Computers** (the leaders in database)

Call us on 01-636 8210 or 01-631 4818

and leave your address for our standard 'infopacks'

Purchasers of a network (h'disk, micro, printer) get the system deal and above software list . . . FREE

IMAGINE EVENTUALLY BEING ABLE . . .

With an IBM PC, Modem, dot matrix and daisy printer, to start your day with our robot task disks working under CONCURRENT CPM 86 (tm).

Enter virtual console 0 and telephone your head-office to call all yesterday's ledger files and store them locally on your hard disk.

Now switch to virtual console 1 and while console 0 runs concurrently for about an hour, get a 1000 mail-shot running to the daisy printer.

Now switch to virtual console 2 and while consoles 0/1 run concurrently, get the 'robot task' of producing a stock-re-order report out to the fast dot matrix.

Now switch to virtual console 3 and while consoles 0/1/2 run concurrently, do some programming, or file-reorganising, or any other task you might require.

Four virtual computers all running concurrently on one computer, batch processing to various devices or else queue-spooling their output through print buffers of up to 500K storage and spreading the load through time on fewer printers.

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This special deal has been constructed in order to balance out some of our existing suplus stock, it is therefore of a considerable equity advantage to the client who may be needing such a configuration.

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The SYSTEM DEAL SOFTWARE value 1480.00 also 20 disks, 90 day warranty and cables.
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We do not have many available!
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74LS13	15p
74LS14	25p
74LS15	12p
74LS20	13p
74LS21	13p
74LS22	13p
74LS26	14p
74LS27	13p
74LS28	14p
74LS30	13p
74LS32	13p
74LS33	14p
74LS37	14p
74LS38	14p
74LS42	30p
74LS47	36p
74LS48	45p
74LS51	14p
74LS55	14p
74LS73	18p
74LS74	18p
74LS75	18p
74LS78	18p
74LS83	36p
74LS85	40p
74LS85	40p
74LS86	16p
74LS90	22p
74LS92	20p
74LS93	22p
74LS95	40p
74LS96	50p
74LS107	20p
74LS109	27p
74LS112	20p
74LS113	20p
74LS114	22p
74LS122	25p
74LS123	34p
74LS124	90p
74LS125	24p
74LS126	25p
74LS132	34p
74LS133	25p
74LS136	25p
74LS138	27p
74LS139	27p
74LS145	70p
74LS147	100p
74LS148	75p
74LS151	40p
74LS153	40p
74LS154	80p
74LS155	30p
74LS156	36p
74LS157	25p
74LS158	30p
74LS160	38p
74LS161	36p
74LS162	36p
74LS163	36p
74LS164	40p
74LS165	50p
74LS166	60p
74LS170	70p
74LS173	55p
74LS174	40p
74LS175	40p
74LS181	90p
74LS183	120p
74LS190	36p
74LS191	36p
74LS192	36p
74LS193	36p
74LS194	35p
74LS195	35p
74LS196	45p
74LS197	45p
74LS221	50p
74LS240	55p
74LS241	55p
74LS242	55p
74LS243	55p
74LS244	55p
74LS245	70p
74LS251	30p
74LS253	30p
74LS257	30p
74LS258	35p
74LS259	55p
74LS260	22p
74LS266	20p
74LS273	55p
74LS279	30p
74LS280	100p
74LS283	40p
74LS293	40p
74LS295	90p
74LS298	90p
74LS299	180p
74LS323	160p
74LS324	150p
74LS348	90p
74LS352	60p
74LS353	60p
74LS356	250p
74LS363	140p
74LS364	140p
74LS365	30p
74LS367	30p
74LS368	30p
74LS373	55p
74LS374	55p
74LS375	70p
74LS377	70p
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74S74	75p
74S85	450p
74S86	180p
74S112	90p
74S113	90p
74S114	90p
74S124	300p
74S132	110p
74S133	60p
74S138	120p
74S139	120p
74S157	250p
74S163	300p
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2 4570MHz	280p
5.068MHz	150p
3 5795MHz	100p
3 686MHz	300p
4 00MHz	150p
4 194MHz	200p
4 43MHz	110p
5 00MHz	175p
5.068 MHz	210p
6 0MHz	150p
6 144MHz	150p
7 0MHz	150p
7 168MHz	175p
8 86MHz	175p
10 00MHz	175p
10 7MHz	150p
12 00MHz	150p
14 318MHz	150p
16 00MHz	200p
18 00MHz	200p
18 432MHz	150p
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20 000MHz	200p
24MHz	£3
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Double	210p	230p	345p	540p

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DIN 41617 31 way	200p	200p
DIN 41612 2 × 32 way		
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2 × 32 way Ang. pin	325p	400p
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(please specify a + b or a + c)

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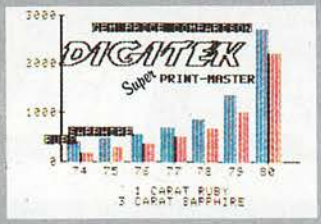

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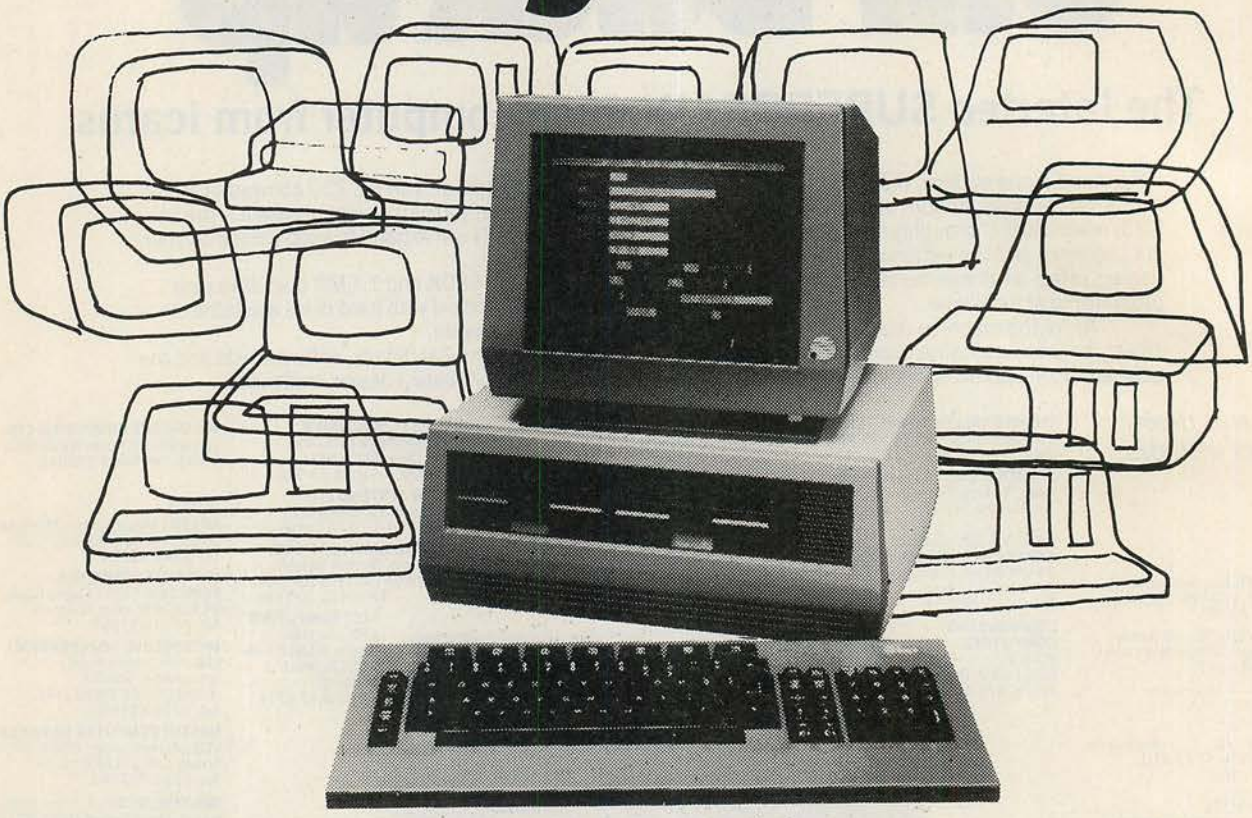

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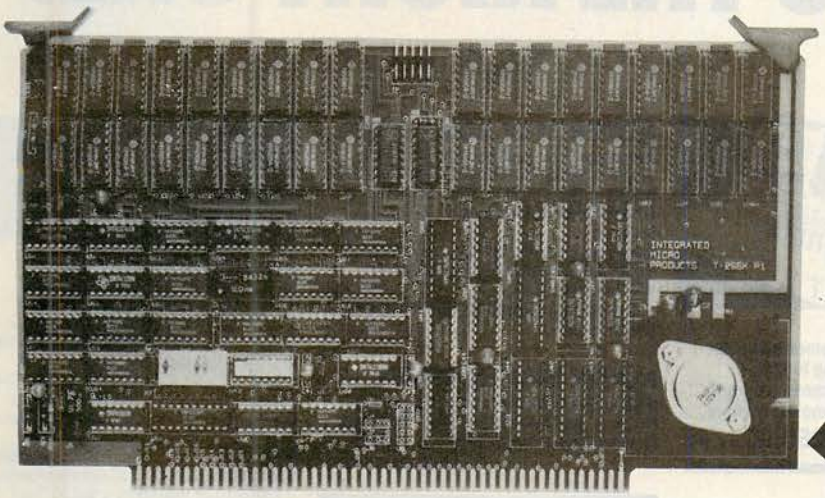

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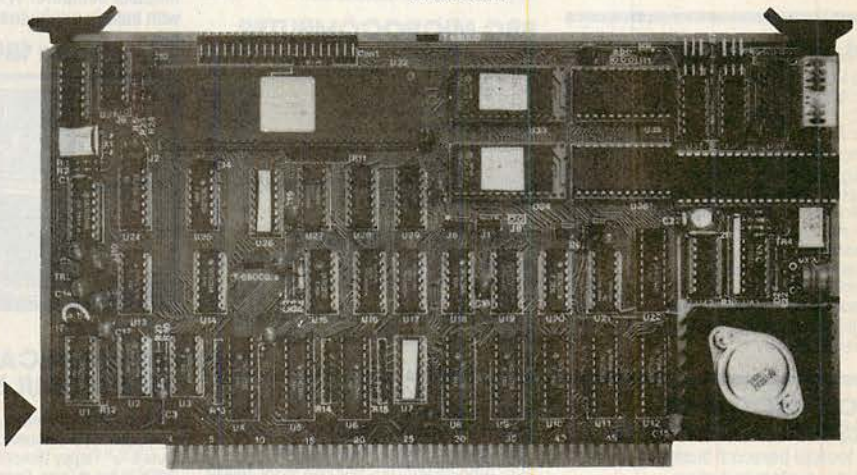

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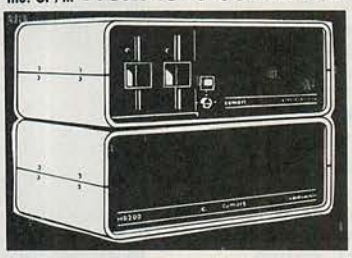

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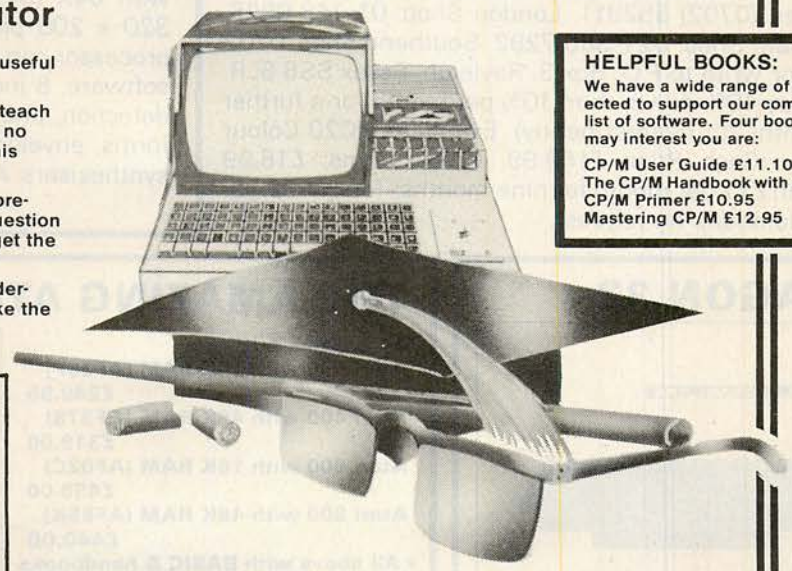

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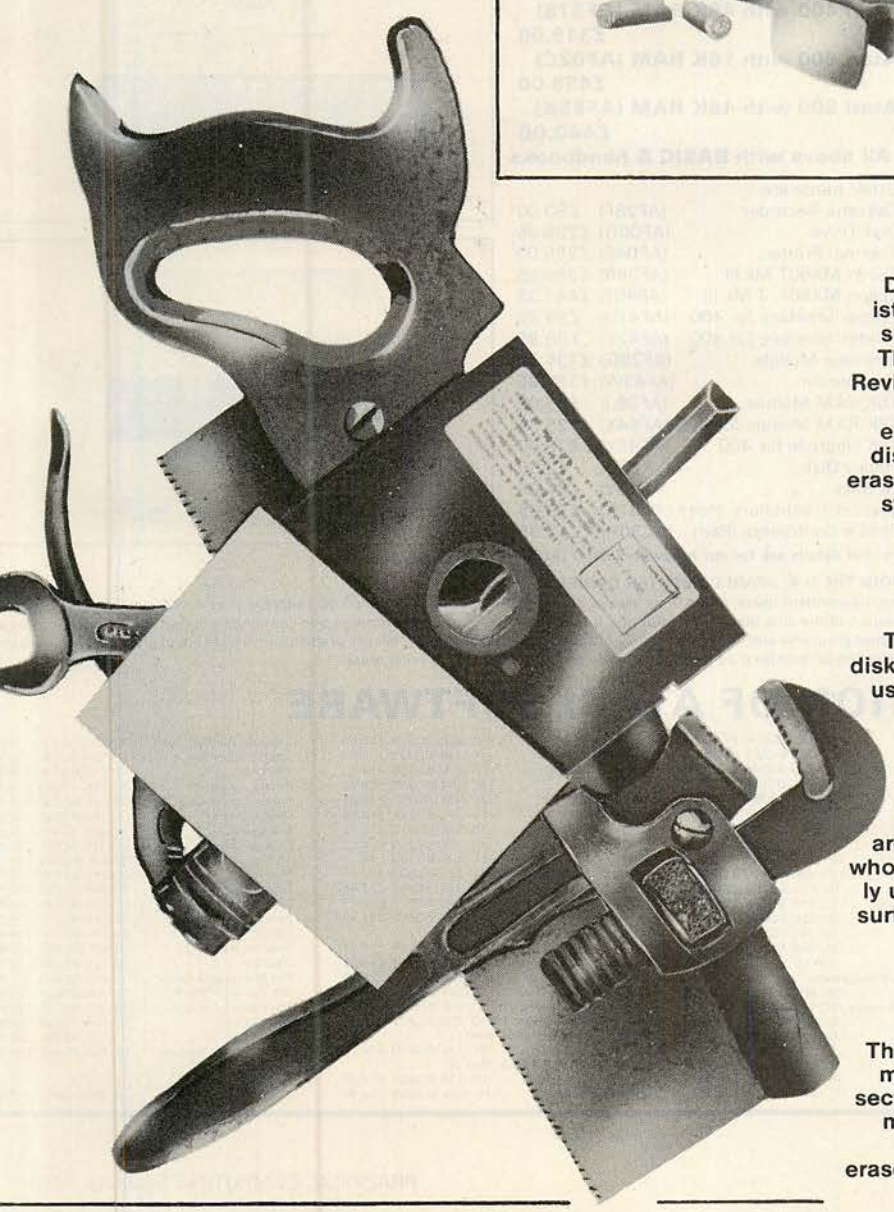

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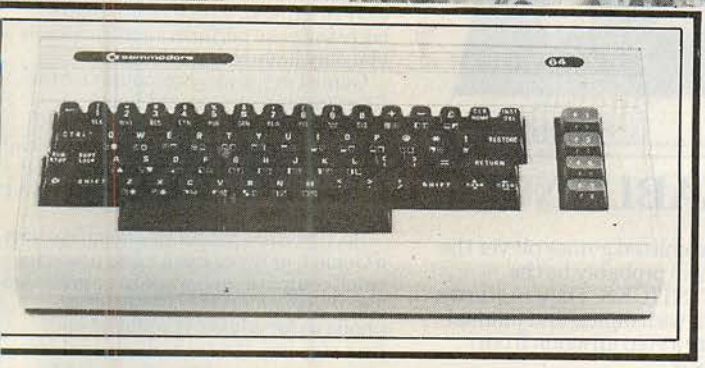

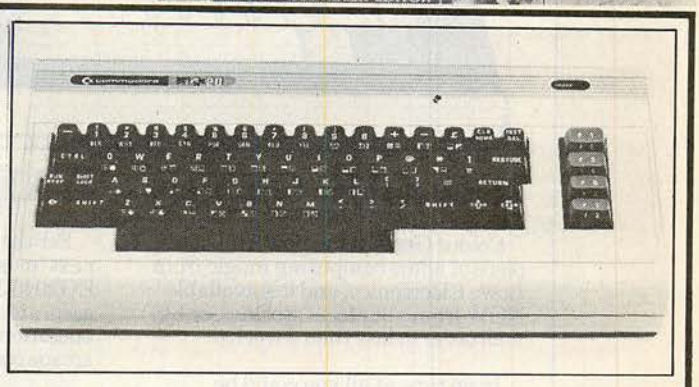

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Education (CSE & GCE 'O' Level Revision)
All cassette based and require at least 8K expansion memory.

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Books About VIC

Learn Programming on the VIC	(WA31J)	£2.50
VIC Revealed	(WA32K)	£10.00
VIC Programmers Reference Guide	(WA33L)	£9.95
VIC Graphics	(WA48C)	£10.00

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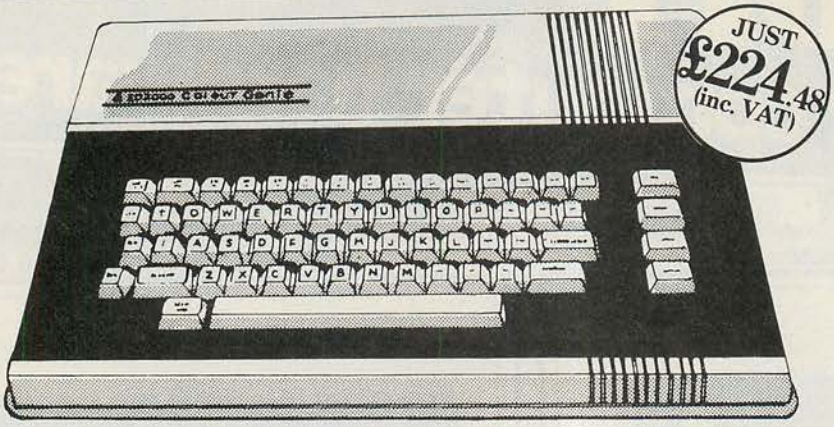

COLOUR GENIE – AVAILABLE NOW!

Colour Genie is the powerful new piece of home computing magic from Lowe Electronics, and it's available NOW from your local stockist, or by mail order in less than 3 weeks!

In no time at all you could be connecting the Genie to a standard colour TV. Its 16K RAM, 16K BASIC ROM and full size typewriter keyboard instantly connecting you to a whole new dimension of vivid colour, high resolution graphics and fabulous 3 channel music synthesiser, with pre-settable tempos.

The whole family will be enthralled by its possibilities. Add the EG2016 MATCHING CASSETTE

£28.75 (inc. VAT)

RECORDER for instance, and right away you can either load pre-recorded software onto your Genie, or store your own programs. Then, if you fancy a spot of intergalactic travel, or a battle for the planets Genie will lay on the transport. When you get tired of the kids beating you at Space Invaders you can always turn their attention to schoolwork. Colour Genie uses the popular Z80 Central Processing Unit, and is fully programmable in level II BASIC, the most popular home computer language in the Western world.

£49.49 (inc. VAT)

For the committed games player the next 'must' will probably be the EG2013 JOYSTICKS. They're sturdy, accurate and, with digital and manual operation, are a step up again from arcade controls.

However the more serious user might prefer to invest his money first on the addition of an EG2011 16K RAM CARD which slots in and effectively doubles the Random Access Memory **£38.50 (inc. VAT)**. Or perhaps the EG2014 LIGHT PEN, which plugs straight into the side of the Genie **£17.25 (inc. VAT)**. Both are extremely effective ways to enhance the colour graphics facility.

Finally, if you really intend to put your machine to work, at home or in your business, you'll need a printer like the EG603 MICROPRINTER. It's a quality dot matrix printer with an impressive specification... simple to operate, reliable and extremely versatile. Should you require it, the printer will accept paper whether in roll or single sheet form with one or even two copies attached. Full 80 column width in any of the 3 different typesizes available. **£270.25 (inc. VAT)**

To connect this, or any other compatible printer, you also need the EG2012 PRINTER INTERFACE CABLE. **£39.50 (inc. VAT).**

So there you have it – a home microcomputer system that expands a computer for the creative mind right up to a realistic business machine. We not only deliver the best specification but we deliver the ColourGenie fast, so why wait?

GENIE I

Tried and trusted! – The Genie I is still one of Britain's best-selling small computers, with over 14,000 sold, and it's easy to see why! Software compatibility with Level 2 BASIC means there are literally 1000's of programs on the market ready to run on the Genie, including educational, leisure and small business applications. It's easy to expand, with a vast range of accessories to perform many functions – you only have to read this ad!

Genie I is the ideal computer for the first time buyer, to use at home, at school or at work. The simple BASIC language enables you to write your own programs with ease, and the Microsoft Extended BASIC offers many powerful extra features.

So, if you are not lucky enough to own a Genie I, or if you have a less powerful small computer and want to upgrade, go along to your local Genie dealer, or phone us for advice. It could be your first step into the enthralling world of microcomputers. **£330.05 (inc. VAT)**

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GENIE II

Equally popular and totally reliable! – The Genie II is a breakthrough for small business computers. Harnessing all the advantages of the Genie I, including its low price, Genie II adapts perfectly to commercial functions with the addition of the following features:

* Numeric Keyboard
* Four User-Definable Function Keys
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Genie II is an ideal, first-entry, computer for the small business. Corner shops, professional practices and small manufacturers can all benefit from a Genie II business system.
£299 (inc. VAT)

GENIE III

The latest addition to the exciting Genie range! Genie III really is the key to successful business. A powerful 64K Micro with built-in screen, 700K each dual disk drives and a full size, detachable typewriter keyboard. Business software packages are available from most dealers, and the Genie III can be supplied with the option of a dot matrix or daisywheel printer.
£2,242.50 (inc. VAT).
For further advice, see your local dealer or contact Lowe Electronics direct for advice.

GENIE I & II ACCESSORIES

PRINTERS

G 3085 is quiet, fast and efficient. eed is 120 characters per second and ; is bi-directional with 6 different er pitches from 40 to 136 characters per Print Buffer. Forward and Reverse Line oftware adjustable line spacing, Bit Graphics and Proportional Printing. e for use with other systems, it has three les, adjustable pin or friction feed and heet or roll paper facilities. £410.55 inc. VAT.
G 603 is an ideal choice if you don't want hat much for a printer. It doesn't match 3085 in certain areas, but you will still haracters per second, a range of er styles, and pin/friction feed, with 96 ers and 64 graphic patterns. inc. VAT.

HER HR-1
wheel Printer
an now buy a superior daisywheel printer ice only previously associated with dot models.
Brother HR-1 is an enticing addition to stem. It has a print speed of 16 cps, bi-nal, range of 8 typefaces, and a choice of dels with either parallel or RS232 es. This model also enjoys a 2K PRINT R as standard.

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UR COMMAND

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016 PARALLEL PRINTER
ERFACE AND CABLE
EG 3016 is an interface allowing a onics parallel compatible printer such as an 3, EG 3085 etc to be connected directly to nie keyboard without the need for an der box. £43.70 inc. VAT.

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E MONITORS
good performance, low priced 12" rs, either to match your Genie or tible with a wide range of other systems. esolution and band width and, of course, ee your television set for the other type of mmes you like to watch!
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The updated EG 3014 expansion box allows for up to four disk drives and printer with optional double density, RS232 or S100 interface. Not bad value at £218.50 inc. VAT. (16K version) or £230 inc. VAT (32K version).
*The EG 3014 will work with TRS 80 using the EG3023 Tandy Adaptor.

EXPANSION OPTIONS

EG3020 SERIAL INTERFACE
Allows the Genie owner to communicate with other computers, use serial printers and telephone modems; in fact to talk to the world!
The EG3020 is a bidirectional RS232 serial interface for the EG3014 allowing baud rate of 110 to 19200. Word length is selectable between 5 and 8 bits. Parity and stop bit settings are switch selectable. Price £45.54 inc. VAT.

DISK DRIVES

If you want fast reliable program storage, true random access to many computer languages, we can meet your needs. The EG 400T provides storage of up to 184320 bytes per floppy disk and comes complete and tested in a stylish colour-matched cabinet. £253 inc. VAT.
The EG 401 AT offers duel disk drive with 368640 bytes of useable storage and comes complete with a power supply ready to connect to an expansion box. £425.50 inc. VAT.

DOUBLE DENSITY ADAPTOR
Allows the use of standard minidisk drives in double density, with virtually double storage capacity. The EG 3021 is equally at home in the Genie or TRS-80 expansion boxes. Double Density Adaptor £82.80 inc. VAT.
For the above, a double density disk operation system will be required. One such system is Smal-LDOS.
Powerful, yet reasonably priced, the Genie Smal-LDOS contains 21 library commands, 7 utilities, LBASIC, disk basic and bags of information, including a reference manual and 40 page beginners guide to disk usage £40.25 inc. VAT.

EG3022 BUS ADAPTOR

Gives full S100 capability to the Genie computers. The EG3022 supports any two S100 cards. Price £73.37 inc. VAT.

BUS EXTENDER

A most useful accessory, allows two bus using devices to be connected simultaneously to the Genie - when using the Hi Res and expander for instance. £24.15 inc. VAT.

EP1, EP3

Are 1.5 K additional EPROMS for Genie I & II.
EP1 Adds all Genie I software facilities to other Genies: lower case driver, machine language monitor, renumber facility, keyboard repeat and screen print.
EP3 Has HI-RES driver software with 10 extra HI-RES commands which prevent the need to load HI-RES software from tape. All at £13.80 inc. VAT. For Video Genie Systems, the LE-19 connects direct to the Genie bus and allows one of these EPROMs to be fitted externally. £30.47 inc. VAT.

TANDY BASHER

If you are a TANDY user read on! The EG 3023 is bus converted to allow Genie peripherals to be used with Tandy Model I computers. £18.40 plus VAT.
(Just in case there might be a few strange souls who want to convert in the the opposite direction there is the 50/40 converter which generates a Tandy compatible 40 way bus from a Genie. £21.16 inc. VAT.

BUSINESS SOFTWARE

Specifically written for the Genie II computer, with disks and a suite of packages from the renowned house TRIDATA. The suite includes SALES LEDGER, PURCHASE LEDGER, PAYROLL and STOCK CONTROL Each package is a very reasonable £155.25 inc. VAT. Full details on request.

TECHNICAL MANUALS

Full technical details of Genie Hardware (all you ever wanted to know about Genie).
Genie I/II Technical Manual £10 - No VAT.
Expander and accessories (EG3014). £10 - No VAT.

EQUIPMENT COVERS

Beat the dirt, coffee spills and sticky fingers when your computer and monitor are not in use with these top quality black pvc covers.
Genie CV1 £5.75 inc. VAT.
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9" monitors CV3 4.83 inc. VAT.
Centronics Printer CV5 - £4.83 inc. VAT.

SYSTEMS DESK

Even a compact modular computer system like the Genie benefits from being used on a custom designed system desk. The SD1 system desk is designed to accommodate a complete Genie System and has a special upper shelf to support the display monitor at the best level. The desk is flat packed for easy delivery and finished in attractive teak and charcoal colours. £93.61 inc. VAT.

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Our spreadsheet sy
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There was a time when you could run a business by the seat of your pants.

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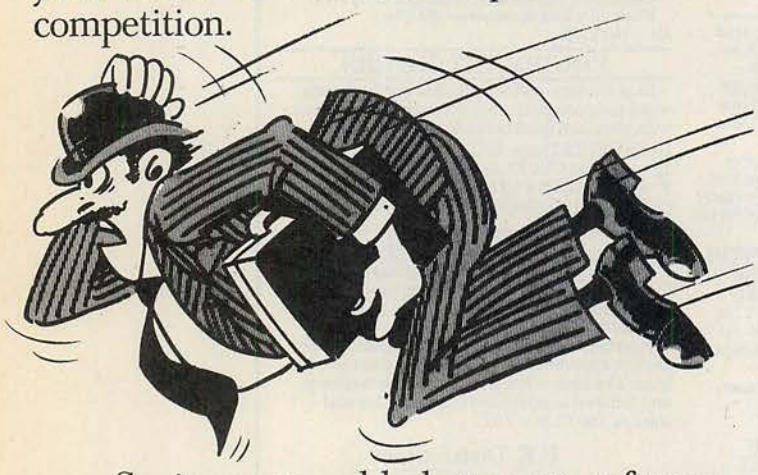


So it seems odd that most software companies still expect to solve all the problems with one system.

A "jack-of-all-trades" if you like.

Fortunately Comshare are not like most companies. We saw the need for different systems to suit different people.

NEW USERS START HERE

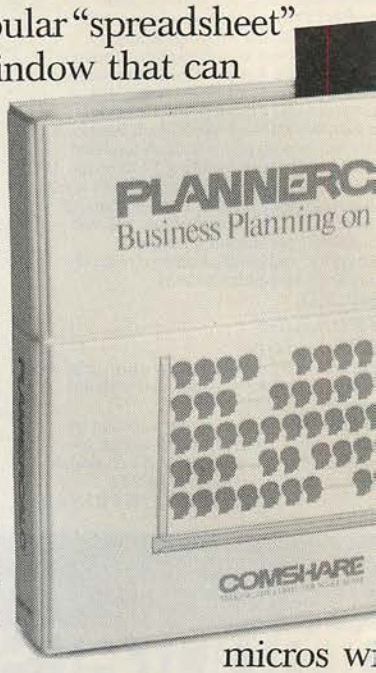
PlannerCalc at £39.00* is now accepted as the first choice for people new to financial planning.

Designed for 8-bit micros, it boasts the kind of features that you'd expect to pay three times as much for. (Buy PlannerCalc's nearest rival and you'll have to.)

Unlike all other 'calc' products it allows you to enter calculation in a language you understand. Plain English.

So it's much easier to use.

It uses the popular "spreadsheet" approach with a window that can be rolled in all directions.



Which means you can enter new figures and rules and immediately see their effect on everything else in the model.

It comes with the best manual on the market and it's suitable for most micros w
a ™CP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimu screen width of 80 characters and floppy disc drives.

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ems start at £39.00. why you need one.

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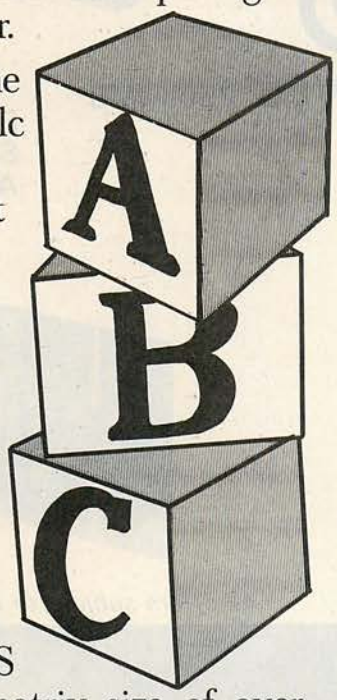
It can store up to 25 standard reports to run when you need them. It's got full WHAT IF? analysis and direct editing of both spread sheet and logic display.

JUST AS EASY TO USE

All this increased power doesn't mean you'll need a degree in advanced computing to understand MasterPlanner.

It works on exactly the same system as PlannerCalc and models written on PlannerCalc run without modification on MasterPlanner.



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A new version of MasterPlanner has been specifically designed for the 16 bit micros like the Sirius 1 under ™CP/M-86 or the IBM personal using either CP/M-86 or ™MS DOS 1.1. With a vast matrix size of over 7000 cells on 128K and even more with larger memory, you'll at last be able to make the most of your micro.

OVER 10 YEARS EXPERIENCE

When you invest in MasterPlanner or PlannerCalc you're not just getting the best software money can buy.

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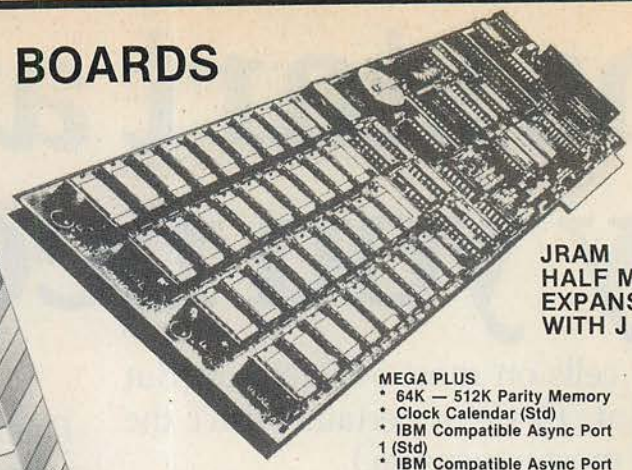

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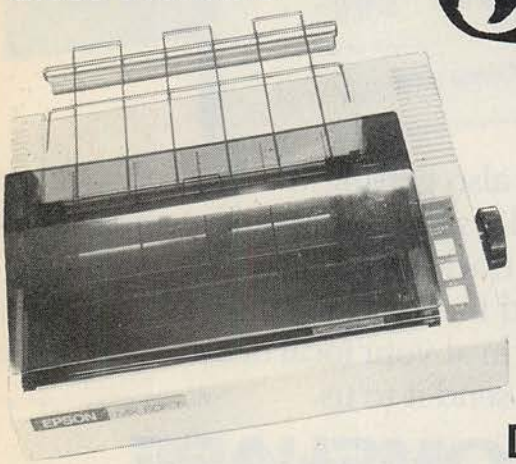

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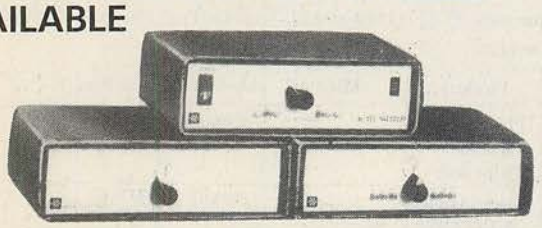

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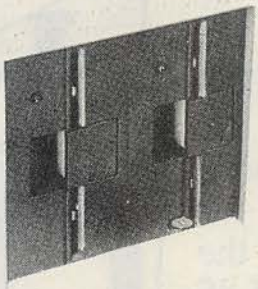

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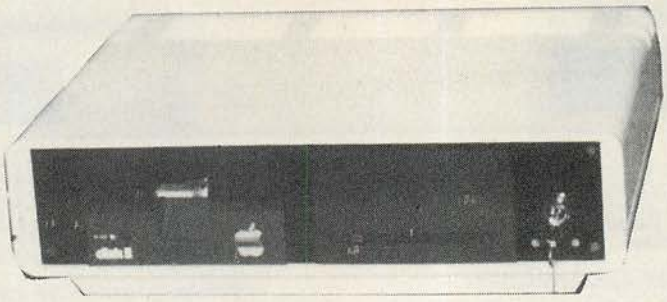

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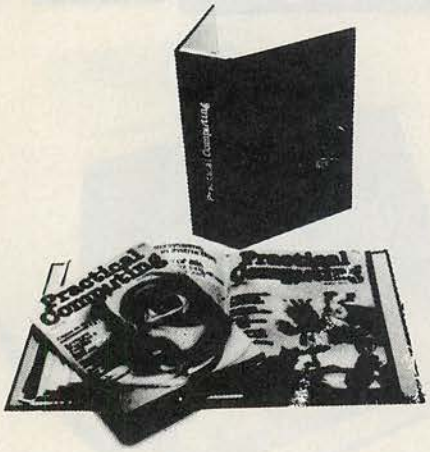

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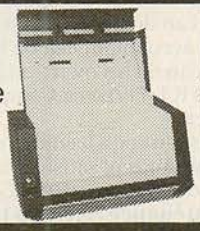

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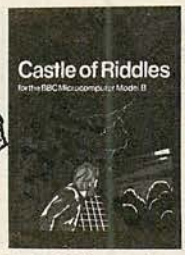

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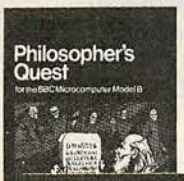

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This, together with descriptions of programming techniques, and the Open File Section which contains hints and items for users of Apple, Pet, Tandy, BBC and Sinclair Computers, makes Practical Computing an invaluable source of information and advice.
So if you've missed a particular issue make sure that you're not missing out on information which could be of real value to you. Just check through the Contents of our Back issues, then fill in and return the coupon below.

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VICTOR 9000

Aimed at the office market, the Victor 9000 has a wide range of packages to support it. Jack Schofield takes a look at this "new" machine.

THE VICTOR 9000 is a new machine that is not really new: it is, in fact, the Sirius 1 wearing a different box. Both these microcomputers are made on the same production line by Victor United, which used to be called Sirius Technology.

The difference in styling does, however, indicate a difference in marketing ideas, The Sirius was styled as a futuristic new micro to sell through computer dealers against established products like the Apple II and III and Commodore micros. The Victor 9000 was styled for the Victor business-equipment subsidiary of the giant Walter Kiddie conglomerate, to sell as part of a range of office products.

In the U.K. the Victor is marketed by DRG Business Machines, which is part of the Dickinson Robinson Group. DRG is a public company with a turnover of more than £600 million, and is particularly known for stationery products, including Sellotape and Basildon Bond.

Victor software

Part of the "office equipment" philosophy is the provision of a range of Victor software to go with the machine. The Victor 9000 supports CP/M-86 and MS-DOS, of course, just like the Sirius 1, so there is a wide range of general packages available. The person who wants WordStar, for example, can have it. The office equipment buyer will probably be encouraged to purchase Victor software including VictorWriter and VictorCalc. Ideally these should have been configured to make optimum use of the Victor's facilities, including the soft keyboard and function keys, but they have not.

The main unit and VDU of the Victor are essentially identical to the Sirius 1, except for being cream coloured instead of brown. For a full review see the ACT Sirius test in the March 1982 issue of *Practical Computing*, pages 54-56.

The Victor's display is memory mapped and refreshed from main memory. The maximum definition is 800 by 400 pixels, which allows very fine character definition and outstanding graphics.

The Victor 9000 keyboard differs in several respects from the one originally supplied with the Sirius. The most obvious difference between the two keyboards is the styling. Where the Sirius keyboard is low and tapered, the Victor version is small and boxy.

The Victor has 10 assignable function keys where the Sirius had seven. One of these is the Help key, number 8. However, function keys 9 and 10 do not appear in the manual which

Full documentation is available.

was supplied with our machine, nor were they used by the Victor software.

Several of the keys are labelled differently on the two versions, though functionally they seem to be the same. The key confusingly labelled Cont — which might tempt the unwary to think it stood for control, Ctrl — now carries the Pause label too. The key which is effectively Ctrl is still labelled Alt.

The Victor has been launched with two operating systems and a small amount of software. The operating systems are CP/M-86 version 1.0 (I/O 2.2) and MS-DOS version 1.25H; each takes up 40K of RAM. The software includes VictorWriter, VictorCalc and the Tabs set of financial packages. Independent software like BusiPost is becoming available too.

In theory, anything which runs on the Sirius 1 should also run on the Victor. However, ACT's Pulsar programs use a special password-protection system which will prevent them from being run on the Victor.

VictorCalc is an electronic spreadsheet program which uses function keys 1 to 7 for commands like Value and Label. It seemed slower and less convenient to use than VisiCalc, but perhaps familiarity with that ubiquitous package prevented the Victor version from getting a fair review. The lack of a manual did not help.

Specification

Microprocessor: Intel 8088; 16 bit with eight-bit input/output; 5MHz
Operating system: CP/M-86, MS-DOS
Memory: 128K RAM, 4K video RAM, 16K ROM
Disc storage: two 5.25 in. floppy drives with 600K storage each
Keyboard: detached QWERTY with keys including 10 function keys and numeric keypad. All keys programmable
Display: 11in. green screen with 80 characters by 25 lines or 132 by 50 lines
Sound: Codec voice synthesiser
Ports: two RS-232C and one Centronics

VictorWriter is actually a version 2.12 of the well-known Select word-processing package. With it you select the function you want — such as Create, Edit, Delete, List, Print, Spell, etc — by pressing the first letter of the word. The special function keys are not used at all. — Even for Help you press H.

VictorWriter is a reasonably versatile word processor which is menu-driven, and screens are clearly labelled so you know where you are. The best thing about it, however, is the Teach program supplied on the same disc. It takes you through the main commands in 26 easy lessons, and it is interactive and offers praise or blame according to how well you do the exercises.

Laugh a minute

The writer has a sense of humour, and uses files called, for example, Whatsup.Doc. If you later get stuck when using VictorWriter, and ask for Help, this calls up the relevant step-by-step instructions from the Teach program. It is therefore possible to become quite proficient after only about two hours use, which compares very favourably with most packages of similar power.

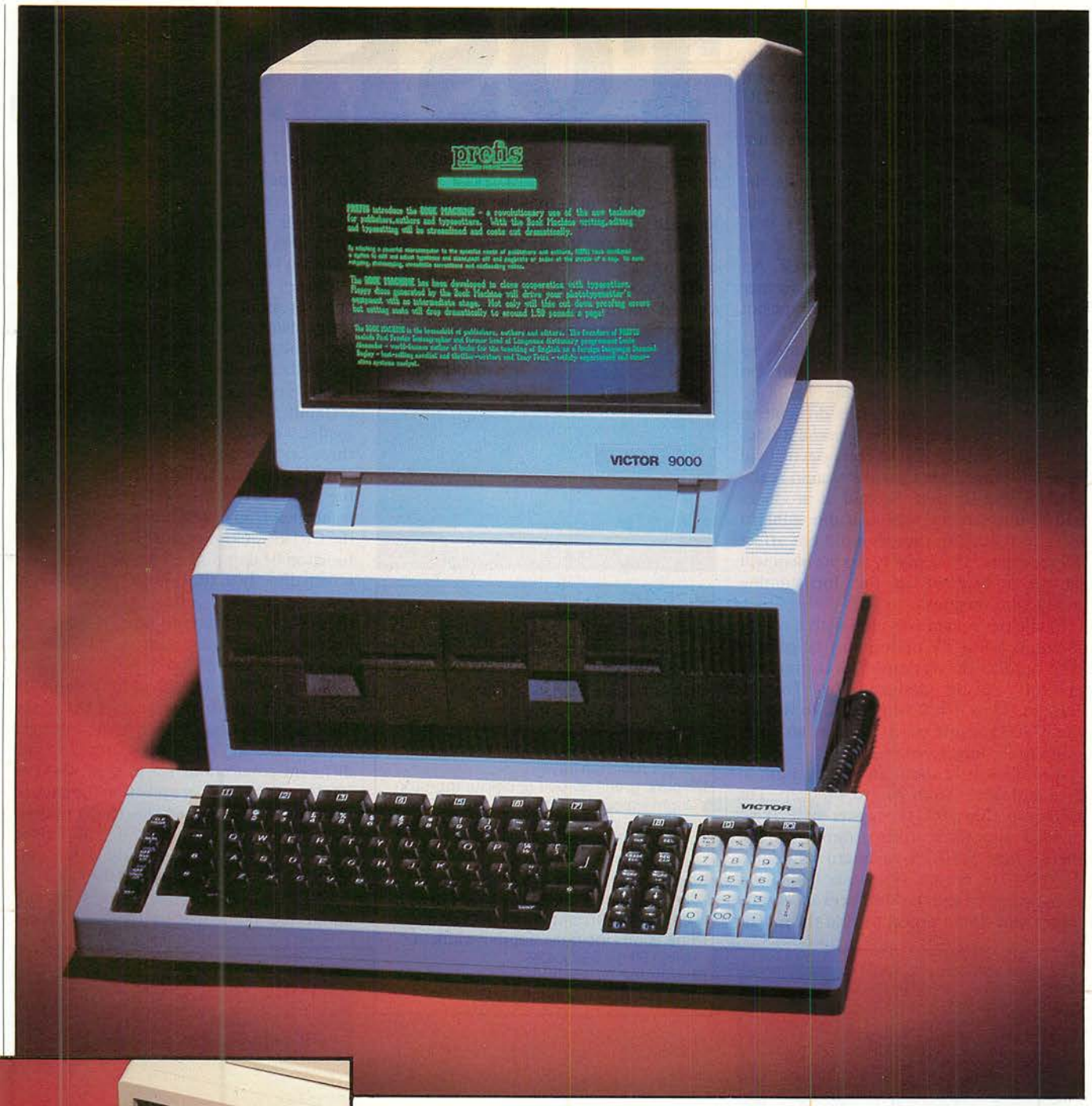
The Victor keyboard is completely "soft" and the Keygen utility allows any character to be assigned to any key. Also, the character set is held in 4K of RAM, not in ROM, so using the Cedit utility it is possible to create new character sets and overwrite the usual ones.

Further, RAM keeps a 16-bit word for each scan line of each character. As characters use a 10-by-16 pixel grid, which means 32 bytes per character instead of the usual eight. Only 10 bits of each scan line are displayed, but other bits can be used for other things like reverse video, underscore, subscript and superscript, etc.

Finally, the Victor provides a range of display options from 80 characters by 25 lines up to 132 by 50. In the highest resolution mode, 40K of RAM is used to address each of the 320,000 pixels individually.

Prefis has used all these facilities in The Book Machine. It is essentially a sophisticated word processor, but is designed to produce discs that can be read directly by a typesetting machine. Thus the screen display needs to match the look of the typeset text — and this must include various typefaces, a range of type sizes, proportional spacing and proper justification. It must also be possible to view the text both with and without the various typesetting commands. This is what The Book Machine does.

It offers up to seven different type styles in a range of sizes from 6 points to 48 points and they can all be displayed on the screen simultaneously. Inter-line spacing is variable



The Teach program helps gain proficiency.

and as well as the standard character set some 250 extra characters are included to cater for foreign-language and scientific publishing.

Being a complex program it is relatively difficult to use, and it makes extensive use of the function keys. The definitions of these keys, which change according to where you are in the program, are displayed along the bottom of the screen.

You can also set up your functions or macros very easily. A convenient way to do this is to use the ten keys 0 to 9 on the numeric keypad. Thus a macro of a sequence of half a dozen keystrokes can be memorised, then entered simply by pressing one key. The technique is useful for entering sequences for frequently used typesetting commands. In fact, the ideal approach would be to customise the whole keyboard as though it was a dedicated word processor. Even as it stands, The Book Machine represents a major advance in word processing for authors, at a price estimated at £6,000 including hardware.

Conclusions

- **The Victor 9000 should be successful since it is the same as the Sirius 1, but this will depend on DRG's marketing approach.**
- **It should expand the Sirius/Victor market by offering a second source of software.**
- **Current software does not fully exploit the facilities of the hardware, but this situation can be expected to improve.**
- **To judge by a pre-release, unfinished version, The Book Machine on the Victor 9000 could make a major impact on the book publishing field in particular.** µ

TOSHIBA

TOSHIBA already has two offerings on the U.K. market, the T-200 microcomputer and the EW-100 word processor — both uncompromising business machines with twin floppies built into a massive VDU casing. By contrast the T-100 or "Pasopia", as it is called in Japan, is transportable if not quite portable.

It arrives in four boxes containing the PA-7161 colour monitor, PA-7200 twin 5.25in. floppy disc drive, PA-7251 dot-matrix printer and, in the smallest of the packages, the computer console itself. An extra box provided a step-down transformer to cope with U.K. mains, the prototype not being designed for 240V.

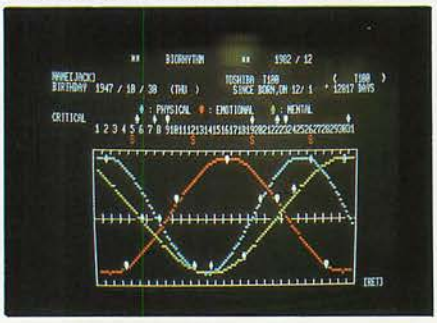
It takes only a couple of minutes to connect the system together, and on powering-up it worked first time. There are only two problems. First, it is difficult to find room for the machine because it does not stack easily. Each component will generally stand alone, so the system really needs a desk to itself. Second, it produces bad RF interference, making it impossible to listen to the radio, though it did not affect TV reception. Presumably the problem will be taken care of in the forthcoming production versions.

While the system was used with a colour monitor, a Pal TV option may be offered with production versions. The converter is currently being designed by Toshiba Europe. Thus it will be possible to market the T-200 console on its own as an entry point to the larger system.

The console is about 16.5in. by 10in. in area and slopes from 2in. to 4in deep. The keyboard has 90 typewriter-style keys divided into three main groupings. First there is the QWERTY keyboard containing 57 keys. The normal typewriter layout has been preserved and the Shift keys are exactly where you would expect to find them. The keyboard is therefore very suitable for touch-typing.

One nice point is that the alphanumeric keys are light-grey while the other keys such as Shift, Ctrl and Return are in a contrasting dark tone.

The second main group is a numeric keypad on the right of the console. It contains 19 keys in a calculator layout: a decimal point and numbers from 0 to 9 plus Cursor control, Return and other keys. Finally along the top of the keyboard are 14 extra keys, including eight assignable function keys.



Specification

Microprocessor: Z-80A, 4MHz
Memory: 64K RAM, 32K Mask ROM, 16K video RAM
Disc storage: 5.25in. dual disc drive; 280K per drive, 254K formatted
Keyboard: QWERTY with 90 typewriter keys, including numeric keypad and eight function keys
Display: green screen or colour monitor; eight colours, Mode 0: 80 characters by 25 lines, or 36 characters by 24 lines
Mode 1: 160 by 100 graphics and text
Mode 2: 640 by 200 pixels
Ports: RS-232C, 600-9,600 baud plus ports for monitor, disc drives and cassette, two slots for ROM cartridges
Dimensions (height x depth x width in mm.) 99.5 x 253 x 429
Distributor: Office International, 247-257 Euston Road, London NW1.

One of the extra keys is labelled Label, and pressing it displays the current assignments of the eight function keys along the bottom of the monitor screen. Assignments used on test included Files, Load, Save, Time, Edit List and Run. It certainly makes life convenient to be able to load, list and run programs by pressing only three keys.

The key next to Label is labelled Kanji, for the Japanese character set, and the next one is labelled Copy. When pressed along with the Ctrl key, Copy performs the very useful function of dumping all the contents of the screen directly to the printer. The last key is red and marked Stop. Pressing it only breaks the program; to reset you have to locate a small, white button hidden from view on the back of the console.

The remaining features of the console are an On/Off switch with green LED in the top-left and a hinged door in the top-right corner. Lifting the door reveals two different connections for plug-in RAM or ROM packs. There are ports on the back of the console for connections to the printer, disc drives, mains and VDU, plus three ports, for example, cassette I/O, only identified in Japanese characters.

The twin disc drive and printer are both about the same size as the console but

T-100

The forthcoming offering from one of the Japanese consumer-electronics giants is inspected by Jack Schofield, who pronounces it a versatile if rather large piece of equipment.

somewhat thicker. The printer is about 4.5in. deep and the disc drives about 5in. Both have green power-on LEDs and, like the colour monitor, are finished in the same silver and deep-brown colours as the console itself. All the units are extremely solidly built and the quality of construction and finish puts some British-made microcomputers to shame.

The disc capacity is 254K of formatted storage per disc, of which the console will run up to four. The dual-disc unit includes a fan, and the noise of that is tiresome — as it is with most such fans. The drives themselves are phenomenally quiet in operation — at least for those of us used to Apple, Atari and Sirius drives. Often one is not sure that anything is actually happening, which means looking at the red Disc in Use warning light for confirmation.

The printer is an 80-column model which prints an eight by nine matrix. Type styles available include pica and elite faces, condensed characters and proportional characters, with the usual enhanced versions produced by double striking. A range of block graphics is included as part of the Toshiba Basic — including signs for playing cards — and the printer handles them quite happily. The colour monitor has only two controls, for brightness and power.

Powering-up the console produces the question "How many files (0-15)?" and then the information that you are using Toshiba T-Basic version 1.1 ©1982 by Microsoft. There are 25,595 bytes free. This version uses OK to mean ready.

The cursor is a flashing underline, but one key press changes it to a flashing block. The initial screen contains 36 characters by 24 rows. However this can be changed to an 80-character screen by typing Width 80. If you type Width 40 you do get a screen 40 characters wide, but it does not occupy the full screen width. TBasic is an enhanced version of Microsoft and includes numerous extra commands such as BSave and BLoad, Chain, Print Using, Input, On Error Goto, TRon and TRoff, If-Then-Else and While-Wend.

There is auto line numbering and the even more useful renumber function — yes, it renumbers your Gotos as well. Graphics functions include Circle, Draw, Line, Colour and Paint. The T-100 offers eight colours numbered from 0 to 7: black, blue, red, purple, lime green, pale blue, yellow and white. There is also a keyboard sounder which can be made to beep or play a note from 0 to 255. It covers a wide range, but could hardly be called musical.

TBasic is an extremely well thought-out language and anyone used to more limited versions of Microsoft will greatly enjoy using it. Its more practical advantage from the point of view of the T-100 is that it is the same language as is already used with the T-200 business micro. T-100 discs are compatible with T-200 discs so Toshiba's standard business software can be run on the new machine. As the Toshiba will also run CP/M version 2.2 the range of business software available is quite respectable.

The alternative Basic language supplied is called OA Basic, and comes in two versions — one ROM based and the other disc based. Plugging in the OA Basic ROM pack without the drives produces Toshiba's copyright logo. The number of bytes free is now 32,738. Curiously, booting up the disc version of OA Basic leaves 32,758 bytes free — 20 bytes more.

OA Basic seems to have most of the same commands as TBasic, except that it probably has easier disc operation. The file-handling commands include Build, Open, Close, Get and Put, Input, and Search. You can use the Build command to create 41 files on each mini-floppy.

Files can be password protected using the Build # statement and an automatic Load/Run utility is also included. The other disc utilities are Initialisation or Formatting, Copying, Sort, Packing of indexed sequential files to rearrange records for the effective use of disc space, and Recovery to restore partly destroyed sequential files. OA Basic also includes a machine-language monitor, and the Term command can be used to convert the T-100 to a terminal. Parity and baud rate, etc. can then be specified.

To sum up, when you power-up the T-100 it first looks to see if the disc drive is switched on and a disc is in drive A. If the disc contains CP/M, enhanced OA Basic or enhanced TBasic it boots that. If not it looks at the ROM slot to see if the OA Basic ROM — or the promised mini-Pascal — is plugged in. If so it boots that, if not it defaults to the built-in TBasic.

In many ways this is very useful but in others it is quite confusing. For example, you are using OA Basic and you type Cls, thinking this clears the screen. It does, but only in TBasic, so instead you have to type

(continued on next page)

Japanese graphics characters and card symbols are in the standard character set.

Basic is built in, but an enhanced version can be added via a plug-in ROM pack.

TOSHIBA T-100

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Screen 0. If you are using OA disc Basic you might type Dir, thinking this will give you the disc directory: it does, but only in CP/M. In OA Basic you must type Cat. Similarly in TBasic you can use the cursor-control keys to do full-screen editing of your program, but in OA Basic you can't. It is easier to type, say, Edit 10 when you want to edit line 10, whereupon this line is reprinted with the cursor on it. The story of the Tower of Babel has certainly not lost its relevance.

The internal organisation of the T-100 seems quite complex. The specification notes that 64K of RAM is fitted as standard, while a further 16K is provided as video RAM. There is also a 32K masked ROM, and RAM packs from 8K to 32K can be inserted in the slots provided.

Programs can be entered in upper or lower case, or a mixture of both. When a program is listed all the lower-case instructions except those in quotes are converted into upper case. Reserved words are stored as tokens so they do not need to be typed out in full, you just need enough of the word to make the reserved word clear. If you use additional spaces to indent statements to make your program structure clearer, your spacing is saved along with the tokenised lines.

Numbers can be integer from -9,999 to +9,999 or floating point. Numeric variables can be either integer, single-precision or double-precision. An integer variable is marked by a % sign and takes up three bytes of memory. A single-precision number up to eight digits long takes up five bytes of memory. A double-precision number, marked with a # and up to 14 digits long, takes up eight bytes of memory. A character string, marked $ is usually up to 32 characters long and takes up memory space equal to its maximum length plus one byte.

It seems that for convenience all strings are automatically dimensioned to 32 characters. Longer strings can be used by using a Dim statement, and when only short strings are being used memory can be saved by using a Dim statement that is less than 32. The maximum character-string length is 255 characters. Dim is also used for declaring a one to 15-dimensional arrays. Long variable names are allowed, but as they take up quite a lot of room in memory they probably should not be too long.

There are three distinct graphics modes for the T-100 with OA Basic. In Text mode only characters can be displayed; in graphics mode both characters and dots can be displayed; and in the fine-graphics mode pixels are addressed individually. The colour resolution of the fine-graphics mode is eight dots wide by any number of single dots deep.

If a single character has a resolution of 1 in the basic mode, then the text/graphic mode has a definition of 8 and the fine-graphics mode of 64. However, because colours are addressed in eight-bit widths the colour resolution of the fine-graphics screen is only 80 horizontal by 200 vertical, even though this number of pixels is 640 by 200.

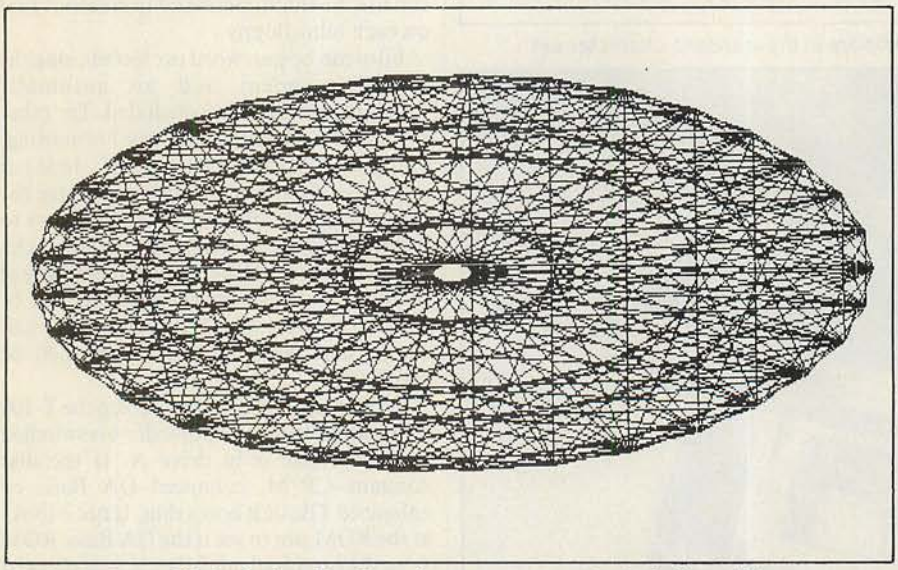
The T-100 takes quite a long time to redraw a colour screen, and it lacks any version of sprite graphics, so it is not particularly good for action drawing. However, all of the colours produced are pure and brilliant — quite unlike the sad colours of the Dragon, for example — and on the Toshiba colour monitor the visual sharpness is outstanding.

The graphics are extremely good when used for thinking games such as chess, Othello and Mastermind; it is only when a moving object has to be continually drawn and erased that the limitations of this straight bit-mapped approach really show up. However, the T-100 is really a business not a games machine. The sheer brilliance of the colours could be used to great effect in business programs. Nonetheless, most buyers will be watching their cash and will plump for the cheaper option of a green screen.

Unfortunately, all the printed documentation on the T-100 is still in Japanese. There is quite a lot of it and it looks extremely thorough. The OA Basic guide includes a separate section on each of the reserved words with worked examples. It also contains a useful guide to the couple of dozen codes for error messages. The documentation is currently being translated and corrected in England, which should compensate for Toshiba's occasional lapses when it comes to English spelling.

The T-100 is sold in the U.K. by Office International Ltd, the sole distributor. Office International is a substantial company with an annual turnover of around £40 million and some 2,000 employees including about 700 technicians, and already sells Toshiba's T-200 micro and EW-100 word-processor, and provides nationwide support.

Office International says it is not yet able to give a price on the T-100, but including the colour monitor and 80-column printer the price is expected to be under £2,750. This will put it out of range of most home users and personal computer buyers, but it is by no means expensive in comparison with less sophisticated products from other large corporations providing such a wide range of office equipment and consumer goods.



Circles become elliptical when Esc-Copy dumps screen contents to the printer.

Benchmarks

Standard benchmark tests reveal that T-Basic runs a lot faster than OA Disc Basic on the T-100. All timings are in seconds, and average three runs.

	1	2	3	4	5	6	7	8
T Basic	1.2	3.7	11.1	10.9	11.6	20.3	32.0	59.0
OA Disc	2.0	4.2	12.8	17.6	20.5	28.0	40.5	158.5

Conclusions

- **The T-100 is a well-designed and well-finished microcomputer which is small enough to be transportable. However, the system as a whole has a large "footprint" and will probably require its own desk.**
- **It is a versatile machine already capable of running several languages, and the ROM sockets offer possible expansions including RAM "discs".**
- **OA Basic is large and extremely easy to use, though its execution speed is relatively slow.**
- **The T-100 offers an excellent display and brilliant colour though it is not particularly suitable for moving graphics.**
- **The price may not be low enough to tempt home buyers, but with distribution through a major office-equipment supplier it could well find buyers among the existing T-200 user base and in larger businesses.**

EPSON QX-10

Ian Stobie takes a look at another eight-bit CP/M micro from Japan.

THE WORLD'S LARGEST supplier of dot-matrix printers and liquid-crystal displays is about to launch itself into the mainstream of the microcomputer market with a desk-top CP/M machine. Epson's new machine will not go on sale in the U.K. before April, but I was able to take a good look at it on a recent visit to Epson's U.K. headquarters in Wembley.

The QX-10 is a conventional CP/M machine built around the eight-bit Z-80A chip. But it has a very modern appearance and will sell at a low price — under £2,000 for a complete system, less the printer and application software. The ergonomic standard of the whole system is high, as it will clearly have to be if the QX-10 is to compete successfully in a market made more demanding by the arrival of the generally very good-looking and well-designed 16-bit machines, like the IBM, DEC and Olivetti microcomputers.

Epson's decision to go for a standard eight-bit CP/M system rather than follow the 16-bit path needs some explanation. Back home in Japan, both Epson and its parent company Seiko market a range of several different desk-top computers. But in selecting the best machine for the crucial attempt to break into the world desk-top market Epson has clearly been swayed by its perceptions of what European and American consumers actually want, and in particular by the realisation that it is dealers who sell machines.

The QX-10 is aimed at giving the dealers what they want: a modern-looking machine with good keyboard and display, running CP/M because that is what the customers are actually asking for, with a large standard memory and a low price. Epson has proved that it can innovate with the HX-20, the 4lb. portable computer; this time it is doing what it thinks another segment of the market requires by being conservative.

Epson has about 100 dealers in the U.K., and they reportedly like the new machine.

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After all, why should any dealer start asking customers to pay more for a barely understood technical mystery ingredient and an operating system the dealers themselves are unfamiliar with? An eight-bit CP/M machine gives access to the wealth of tried and tested CP/M application software packages, and requires less effort and new learning.

Externally the QX-10 follows the design approach of recent 16-bit machines like the Sirius, IBM and DEC microcomputers in being housed in three boxes. The CPU and discs go in one "system" box, while the screen and keyboard are each on the end of their own single-strand cables.

The keyboard uses the standard typewriter layout and has a nice feel to it. It has a separate numeric keypad and 18 carefully grouped function keys. The cursor-control keys are laid out logically with up above down, and left to the left of right; for some reason this natural pattern is rare even on otherwise well thought-out keyboards. The keyboard unit is light enough to be comfortable resting on your lap on the end of its coiled, telephone-style cable, but heavy enough to stay in one place on a table under heavy pounding. It represents a good attempt to put into practice the current consensus on what a good keyboard should be like.

The display is also modern in appearance; the 12in. monochrome green screen occupies a large proportion of the front surface, keeping down the space occupied by the unit on the desk. It can show 25 lines of 80 characters, 400-by-640 point high-resolution graphics, or mixed text and graphics. The standard character set makes up characters using a 14-by-18 dot matrix, giving a very readable display. The U.K. machine will probably come with an add-on multi-fount ROM board included in the price, which will allow up to 16 different type founts to be displayed.

The QX-10 uses a separate NEC 7220 processor chip to handle the display, with its own dedicated 32K memory area allowing the Z-80A to continue processing while the display is being updated. This does have some disadvantages compared to a straightforward memory-mapped approach, but the compensation comes in the high-level graphics routines built into the firmware. These provide high-speed drawing of lines and circles, together with rapid block filling, screen panning and scaling. The results displayed on the screen can be dumped directly to an Epson printer plugged into the parallel port.

The standard system comes with a light-pen socket together with supporting firmware. All that is necessary is an add-on light-pen. An optional colour board allowing eight-colour graphics will be available for use with an RGB monitor. The only disappointment is that the standard monochrome monitor supplied with the Epson QX-10 will only be available in green; given the general attention to meeting the customer's ergonomic preferences the current fashions for amber or white on black screens are overlooked.

The system box itself is fan-cooled, and will work satisfactorily either upright or mounted sideways. This means it can be moved out of the way, attached to the side of the desk or built into it, for instance, leaving only the keyboard and display unit to take up space on the desk top.

The system box is fairly compact considering it contains the main circuit board with the processor and up to 256K of RAM, five expansion slots and two floppy-disc drives. It looks rather like the system box of the multi-user Fortune system. The two slim-line 5.25in. floppy-disc drives take up little space. They are manufactured by Epson, and are to be sold on their own to other manufacturers. Each disc holds 320K when formatted, giving the user 640K of on-line disc storage as standard.

An Epson hard disc is not available, but Epson is encouraging other disc manufacturers to provide them. Epson already has a suitable high-speed interface card so only the appropriate disc controller is needed. Talks with Corvus to link the QX-10 into the hard-disc based Omninet local area network are at an advanced stage.

A panel on the left-hand side of the system box pulls off to reveal five expansion slots for all these hardware add-ons and, on the machine we saw, three unpopulated banks of RAM sockets. The U.K. machine will come with 192K as standard, so only one bank of eight sockets will be free, allowing expansion up to 256K. Epson has used 64Kbit chips, which is another reason why the system is so much more compact than older Z-80 based CP/M systems.

Software supplied with the machine is CP/M 2.2 from Digital Research, and a full version of Microsoft MBasic with machine-specific extensions added by Epson. The Basic will support up to 16 different typefaces if the character-generating ROM board is fitted, and has been dubbed Multifont Basic.

A 4MHz Z-80 based machine running MBasic will not process most Basic routines much more slowly than most of the 16-bit machines currently on the U.K. market. Machines like the ACT Sirius, Victor 9000 and IBM PC use the Intel 8088, which fetches and processes data and instructions in chunks no bigger than the Z-80 does. If the speed of language processing really matters, which is unlikely in most applications, it is only machines like the Zilog Z-8000 based Olivetti or the Motorola M68000-based Fortune which are likely to be significantly quicker.

Specification

SYSTEM BOX
Dimensions: 508 × 340 × 103mm.
CPU: Z-80A running at 4 MHz, assisted by NEC 7220 graphics controller
Memory: 192K RAM expandable to 256K
32K dedicated video RAM arranged as one-high resolution graphics page of 16K and eight text pages of 2K
2K of battery protected CMOS RAM
Clock: battery-powered day, date and time
Discs: twin slim-line Epson-manufactured 5.25in. floppies, 320K each
Bus: five free expansion slots
Standard interfaces:
light-pen connector
parallel printer interface
RS-232C communications interface

DISPLAY
Dimensions: 340 × 312 × 270mm.
Type: monochrome green on black 12in. CRT.
Displays: 25 lines by 80 characters or 640-by-400 point high-resolution graphics

KEYBOARD
Dimensions: 508 × 224 × 48mm.
Type: Detachable with standard QWERTY layout and spacing
Features: 103 keys in all, with 16-key numeric keypad, eight-key cursor control block, 14 function keys in four blocks; all keys software redefinable

Software included in price: CP/M 2.2 from Digital Research; Multi-fount Basic, version of Microsoft MBasic
Hardware options:
colour board displays eight-colour 640-by-400 dot graphics to monitor
high-speed optical-fibre interface; two channels to support two hard discs at 500Kbits per second
multi-fount character-generator ROM board
RS-232 interface board; four additional channels supporting synchronous or asynchronous communication
IEEE-488 interface;
AD/DA convertor
universal breadboard
Omninet board
direct-coupled Modem
Distributor: Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HAG 6UH. Telephone: 01-900 0466. Available from April 1983.

Conclusion

- **The QX-10 is a thoroughly modern machine despite the use of an eight-bit Z-80A processor and the standard CP/M operating system. In particular, the standard of the keyboard and display is similar to more expensive 16-bit machines.**
- **CP/M still provides the greatest choice of application software packages. For this reason many users, adopting the sensible approach of selecting their software first, will be looking around for an up-to-date machine to run it on. The QX-10 looks like being an excellent choice, and certainly cheaper than any 16-bit machine, especially since many of the leading brands require modifications to run eight-bit CP/M.**
- **Documentation was not available for review, but is an important part of any system.**
- **The price is expected to be in the £1,700 to £2,000 range, in which case the system is a clear winner. Epson is aiming to establish its machine as the standard, budget CP/M computer, in the place of the Superbrain, Televideo and similar machines.**

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LVL DUAL DISC DRIVES for the BBC Microcomputer

John Leach looks at Leasalink Viewdata's disc drives which appear to bridge the gap between Acorn's own drives.

LVL HAS DECIDED on a very sensible compromise configuration between the Acorn/BBC official versions of one-by-100K and two-by-400K drives. The single drive is fairly cheap, but a single-disc drive is really rather like a monocycle: you can get around on it, but two wheels are better than one. The double drive is doubtless excellent but costs about £900, which is something of an overkill for the domestic environment.

Do it yourself

Installation is very easy. By arrangement with Leasalink I made the necessary modification myself. All you have to do, apart from plugging in a handful of chips, is cut one clearly indicated track on the circuit board, cut one soldered-in pin on a chip and link it to the other side of the cut track.

After checking that the right chips were in the right places I plugged in the disc drive and switched on. There was a click and a whirr and the screen showed:

ACORN DFS
Language?

Despite all my checks it would display nothing else.

I had to get on the telephone and ask what was going on. "Have you plugged in the Basic chip?" Lesalink said. "No" was the shamefaced reply. While still on the phone I plugged it in, pressed Shift-Break and there was a multicoloured greeting message from the utility disc.

The instruction leaflet failed to mention that Basic had to be plugged in, and it would not have been easy to decide what to do as three empty sockets remained on the board after putting in the new operating system and the disc-controller software.

With the LVL disc-drive kit you receive the rare and famous version 1.0 operating system. It includes all the exciting *FX calls described in the handbook, and they really do work. This is an EPROM version, with two chips on a carrier board, but in due course it will be replaced with the fully debugged version 1.2.

You also receive the disc software programs, the 8271 disc-controller chip and various gates as shown on the circuit diagram in the handbook. Last but not least you get the drive unit itself, a neat buff-coloured metal box matching the BBC's case, standing on rubber feet. The drive doors are aligned vertically. It is plugged into the BBC disc interface socket via a long ribbon cable; a four-wire ribbon cable links up to the power-supply take-off at the back of the micro's case.

A utility disc is supplied, containing a disc formatting program and a short program describing the utilities, which comes up when Shift-Break is pressed. Auto-booting is achieved by the operating system looking for a file called !Boot which, if present, is immediately executed. Normally it contains the name of a program to be Chained into memory.

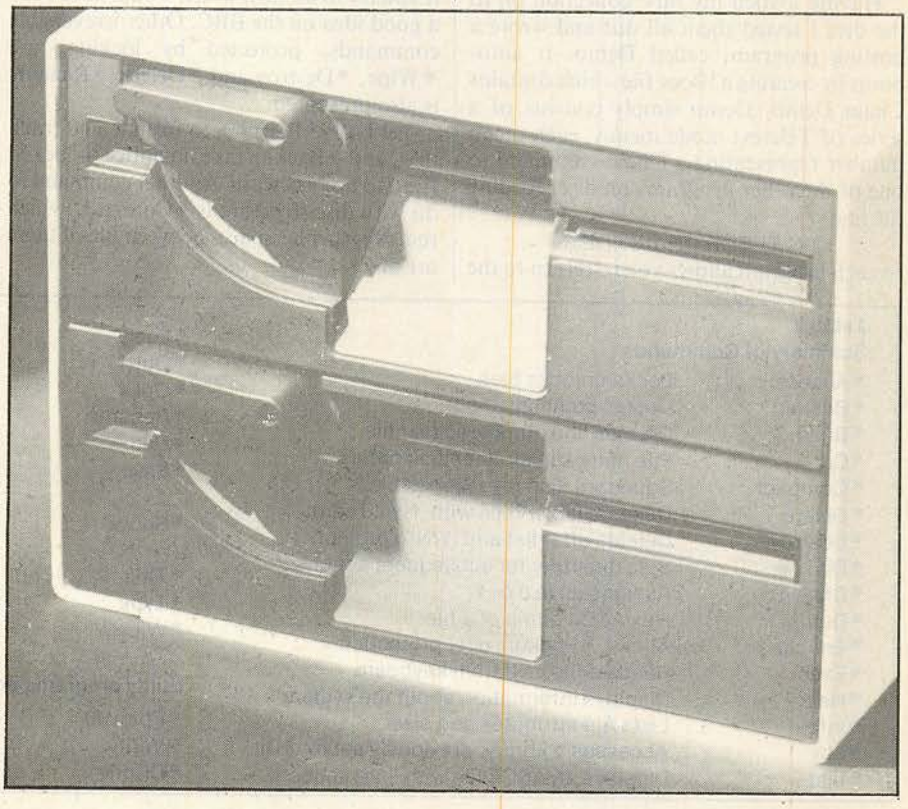
Also on the disc is an intriguing file called Contents, which when listed contains the names of all the programs on the standard Welcome tape. Alas, the programs were not actually there.

The operating instructions supplied are LVL's own version, culled from the Acorn disc handbook. The copy I received appeared to be a draft in photostat which, while providing plenty of information, had many spelling errors, suggesting that it had been sent out in a hurry. Doubtless the full guide will be issued in due course.

The next step is to format a couple of discs on the other drive. This is simply done, using the utility program, and the disc can then be Verified using another of the utility disc programs.

With the system up and working I spent an hour or so using the *Tape command to copy a collection of programs off tape. They can then be copied to disc after returning to disc mode with *Disk. This is made simpler

(continued on next page)



LVL DISCS

(continued from previous page)

by using a couple of the red function keys. At first I thought something had gone wrong, because a moment after entering

```
>SAVE "XYZ"
```

the > prompt reappeared. Yet the program had been saved properly, and showed up when *Cat was used to get a catalogue.

The catalogue is displayed in alphabetical order — a nice touch — and just shows the names of the files as well as some information about the disc. File names can be up to seven letters long.

If you want more detailed information you enter *Info followed by a file name, a *to show all the files or, for example, C* which will give all the files beginning with C. *Info gives the file size in hex, the disc sector where it starts, and the loading position if this is relevant. The wild-card facility using * can be used for all the disc file commands.

The command

```
>LOAD "XYZ"
```

is just as fast as Save, taking about two seconds for a 16K program.

Actually if you are doing all these operations manually there is a slight extra delay. The drives are normally switched off, and it takes a moment for them to get up to speed and move the heads into position with a loud click. When the job is done the drive stays on for only a few seconds before switching off again, so unless you are quite nimble-fingered with a series of operations it keeps clicking away. The delay before switching off could well be increased to 15 seconds or so.

Having loaded my tape collection on to the disc I tested them all out and wrote a hosting program, called Demo. It auto-boots by creating a !Boot file which contains Chain Demo. Demo simply consists of a series of Teletext mode menus, each menu number representing a Chain command to one of the other programs on disc. Adding the line

```
1 ON ERROR CHAIN "DEMO"
```

to each program allows you to return to the menu program simply by pressing Escape.

To one brought up on micros with tapes, the respnse time of the discs seems miraculous under this regime. There is a delay of about one second between pressing Escape and redisplaying the menu, including the time needed to start up the disc drive.

Table 1. Bench-mark timings for LVL disc system.

Write action	Data type	Time (s.)	Data/s.
PRINT # F, "HELLO"	five-byte string	167.67	60 = 315 bytes/s.
PRINT # F,A	real number	144.85	70
PRINT # F,I%	integer number	123.78	82
BPUT # F,B%	byte	31.80	333
Nothing	loop only	1.76	[5,682]

Facilities to suit

The disc operating system contains many other facilities, both necessary and nice to have. For example

```
*BACKUP 0 1
```

copies the disc on drive 0 to drive 1; *Copy allows selected files to be passed across. You cannot execute *Backup without entering *Enable first, to protect you against obliterating a valuable disc.

To access one drive or another you just enter *Drive 0 or 1. Another good command is

```
*ACCESS PROGS L
```

which will lock a file called Progs, while *Access Progs unlocks it. Here and elsewhere the wild-card facility can be used, so you could do

```
*ACCESS * L
```

to lock all the files on the disc.

The command *Save will overwrite a file of the same name unless it is locked. Some systems prompt you with a message like

```
File exists — continue?
```

if you try to do this, which would have been a good idea on the BBC. Other irreversible commands, protected by locking, are *Wipe, *Destroy and *Delete; *Rename is also prevented.

Yet both *Form40, to format a 40-track disc, and *Backup take no notice of locked files, so users beware. Another command to do with disc structure is *Compact, which removes surplus spaces between files if there are any.

Like other disc systems, two tracks are reserved for directory information, and up to 31 files can be taken into account. Trying to add one more gives a Catalogue Full message. If you overdo it you are presented with "Disk Full", which means that you have tried putting nearly 100K on the disc.

Another potentially useful command is *Dump which gives a complete hex dump of the file, showing hex and ASCII where possible. Any of these commands can be output to a printer at the same time as they are executed, which will be appreciated by anyone who has struggled with trying to list *Cat output from tape on an RS-423 output to a printer. It cannot be done directly as the cassette and serial printer output share the same buffer area.

Friendly orders

Among the "nice to have" commands is *Build Myfile which allows you to enter data on to a file directly from the keyboard. It is useful when creating command files to be run later with an *Exec command, as for tapes.

When a *Build instruction is executed, line 1 appears on the screen and you just type in your text. Press Return and a new line number is prompted. You can carry on creating text until Escape is pressed, at which time your text is copied over to the disc file. While typing in text the disc activates from time to time as the memory buffer fills up. You can use the cursor keys to copy parts of one line to another, but unlike a Basic program, you cannot insert or delete lines. This facility provides a very crude word-processing capability, provided you do not need to amend any line after Return has been pressed.

After a file has been created with *Build it can be displayed later either with the *List command to print the line numbers, or

Table 2.
Summary of Commands

*Access	Locks/unlocks files
*Backup	Copies complete disc
*Build	Creates line-numbered text file
*Cat	File names in alphabetical order
*Compact	Squeezes disc files if possible
*Delete	Deletes file, or files with * wild card
*Destroy	Deletes after list and (Y/N ?) prompt
*Dir	Sets directory for subsequent actions
*Drive n	Assigns drive 0 or 1
*Dump	Hex/ASCII dump of a file
*Enable	Allows *Backup, user protection
*Exec	Reads a file as if from keyboard
*Help	Displays information about the system
*Info	Lists file attributes and size
*Lib	Accesses a library, previously set by *Dir
*List	Displays an ASCII file with line numbers
*Load	Loads a file at a specific memory location
*Opt 1	Sets file message display category
*Opt 4	Determines what happens on auto-start
*Rename	Allows name change, on same drive
*Run	Runs a machine-code program
*Save	Copies a chunk of memory; not Basic Save
*Spool	Copies displayed screen contents to a file in ASCII
*Title	Allows naming of a disc
*Type	Displays a text file without line numbers
*Wipe	Removes a file from the catalogue

Utility programs on disc

*Form 40	Formats a 40-track disc
*Verify	Verifies a disc for track integrity
*DConv	Converts Acorn Atom disc files

*Type which leaves them out. The disc handbook warns against using *List for displaying Basic programs on the disc, as all the keywords are tokenised and will cause havoc from time to time as obscure commands to the VDU driver are obeyed. Naturally this is one of the things one tries out, and a Break is usually required to get things going again.

Just as on the tape filing system, you can use the *Spool command which copies over a Basic program as a text file, and then use *Exec to put it back into memory. This is the best way of merging two or more Basic programs — a Procedure library, for instance — with a new program. Ignore anything you may have read about resetting Page, etc; what you do is:

> *SPOOL "PROG1"
> LIST
> *SPOOL [this closes the file]
> *SPOOL "PROG2" etc.

Everything Listed goes on to the output file in ASCII format, so to get the files back into memory:

> *EXEC "PROG1"
> *EXEC "PROG2"

This will read the files — either tape or disc — as though they had been entered from the keyboard. Provided there is no line-number conflict in the two programs they will be effectively merged.

The disc system supports *Run for loading machine-code programs; this command can be abbreviated to *Prog, making the syntax consistent with the operating system * commands.

What happens if your program has the same name as one of the system commands? It would probably be lost forever until *Renamed, as the operating system programs would have priority. The *Save command is the same as for tape, allowing machine-code programs to be located at a specific area of memory when loaded back.

The operating system also allows *Dir followed by a single letter, which sets the directory. Any files subsequently saved will be labelled as belonging to that directory. Conversely

Lib<drive>.<directory>

sets up the system to look for a file in the specified directory. In this way it is possible to have files of the same name on the disc in different directories, such as directory B for backup versions and W for work in progress.

The disc can be given a name with the

*TITLE "A NAME"

command, and finally there is another *Opt command, not to be confused with the Basic Opt keyword, used in assembler programs. The command *Opt 1 n controls the type of message sent out on disc error conditions, as for a tape system. The handbook states that n can have any value between 1 and 99 — though one wonders what for.

The *Opt 4 command, on the other hand, is clearly useful. It sets up the disc to respond differently to the auto-start routine when a !Boot file is present on the disc: *Opt 4 0 does nothing, *Opt 4 1 Loads it, *Opt 4 2 Runs it and *Opt 4 3 Execs it — so you have a wide choice.

With this selection of commands at your disposal you can venture forth and build up a database, subroutine libraries or collections of data, save pictures and diagrams, and store Beethoven's Fifth symphony played as three-note chords.

The system's most serious deficiency is an Append facility, which would allow sequential files to be updated with extra information. There is no direct means of merging files and, unlike large computer systems, it is not possible to have files of the same name but in different version numbers.

I am also unhappy about how easy it is to overwrite a file if data is Saved to a file of the same name, without any warning being issued. Doubtless utility programs can be written to undertake some extra functions, and perhaps it is not really reasonable to expect a mainframe operating system on a single chip.

If you want to write records sequentially to a file you do it exactly as you would on a tape, using Print # N, A% B, C$, etc. The well-known bug that prevents writing of strings across file blocks has been disposed of.

A simple benchmark test was carried out to see how fast data could be written to a disc drive from Basic, using the program in listing 1. Obviously the data-transfer rate, shown in table 1, is much slower than the very fast operating system Save of programs. If you wish to work at this speed the method is described in the handbook, using Osfile to transfer a complete block of memory. The practical implication for the Basic programmer is that files can be written sequentially at about 330 bytes per second, but this is not the best way to use disc files.

One of the main advantages of a disc system over tapes is the opportunity of using random-access files. When a program comes to a statement such as

100 F = OPENOUT("A_FILE")

64 disc sectors out of a total of 400 are allocated automatically. It is possible, using a special technique, to extend this area on a newly formatted disc, by saving blocks of garbage, to be overwritten later. Using

*SAVE A_FILE 0000 8000

will allocate 128 sectors, for example.

Having opened a file you can write fixed-length records to it using the Basic PTR # instruction, which tells the disc system where to write the next record. So in order to write a series of 20-byte records you simply increment PTR # F by 20 and write the next record.

Carry on until you have written all the data, and then close the file. Note that OpenOut diabolically deletes without warning any previously written file of the same name, so some care must be taken if you have valuable information stored away. To read a file you use

F = OPENIN("A_FILE")

and by setting PRT # F you can read any record. Bytes can be written with Bput # and read with BGet # , otherwise use Print # and Input # .

The Openin command also makes a file updatable, so that you can both read and write records within the previously allocated file space, as once a file is Opened, written to and Closed it will thereafter remain of fixed size. You should always close a file in your program when you have finished with it, but if a program bombs out for some reason you will end up with an improperly closed file on disc, which cannot be opened again with your program. Conveniently the Close # 0 instruction closes all files on the disc, so this should be one of the first statements in a file-handling program.

(continued on next page)

Listing 1.

```
10 A= 123.4: B%=123

20 F=OPENOUT("TEST")

30 TIME=0

40 FOR I% = 1 TO 10000: 'write to file':

NEXT

50 PRINT TIME/100 : REM time in seconds

60 CLOSE #F
```

Listing 2.

```
10   REM       Assembler variables
20   REM
30   top       = &12      :REM  2 bytes
40   pageset   = &18      :REM  1 byte
50   pageptr   = &1C      :REM  2 bytes
60   progto    = &70      :REM  2 bytes
70   progfrom  = &72      :REM  2 bytes
80   cli       = &FFF7    :REM Command line
90   REM                        interpreter
100  REM
110  FOR I%= 0 TO 3 STEP 3 :REM 2 passes
120  P%=&0900 :REM RS423 transmit buffer
130  [
140  OPT I%
150            JMP BEGIN \ Bypass CLine
160  .CMD                \ Start of CLine
170  ]
180  $P%="TAPE" :REM The Command
190  P%=P%+6    :REM Reset counter
200  [
210  OPT I%
220  .BEGIN
230            LDX #CMD MOD 256 \LO
240            LDY #CMD DIV 256 \HI
250            JSR cli   \ Set *TAPE
260            LDA #&00  \ Reset PAGE
270            STA pageptr \LO
280            LDA #&0E
290            STA pageptr+1 \HI
300            STA pageset \HI
310            STA progto+1 \ Destination HI
320            LDA #&19
330            STA progfrom+1 \Source HI
340            LDA #&00
350            STA progto \LO
360            STA progfrom \LO
370            LDY #&00 \ Indirect index
380  .LOOP     \ Shift a byte
390            LDA (progfrom),Y
400            STA (progto),Y
410            INC progto \ Adr. LO
420            INC progfrom \ Same as progto
430            BNE CHECK \ Test for end
440            INC progto+1 \ Adr. HI
450            INC progfrom+1 \ ditto
460  .CHECK    \ Is progfrom = TOP ?
470            LDA progfrom+1
480            CMP top+1
490            BNE LOOP \ Not HI Adr.
500            LDA progfrom
510            CMP top
520            BNE LOOP \ nor LO Adr.
530            LDA progto \ Reset TOP
540            STA top
550            LDA progto+1
560            STA top+1
570            BRK \ Exit to BASIC
580  ]
590  NEXT I%
600  END
```

LVL DISCS

(continued from previous page)

The filing system can be changed with a * command, like *Tape to load and save to a cassette. At some time in the future it will be possible to use *Net for Econet, *Rom to get at the empty rectangular hole on the left of the keyboard and even *Teletext to add Prestel costs to your computer budget.

Under the BBC Micro Disc operating system, Basic programs start at memory location 1900 hex. The tape operating system starts Basic at &0E00, so with discs nearly 3K of memory is lost to the user. Many large programs written for tapes and using graphics modes will not run when loaded from discs because of this reduction in memory.

However the short machine-code program in listing 2 will allow you to Save programs on disc and Load them into memory under Dos, and then move the Basic to 0E00, at the same time resetting the necessary zero-page locations to change Page and Top. This allows programs to be run from the new position. As a protection for the user, Tape mode is also invoked, so subsequent requests for Save and Load will assume the use of tapes.

Specification

Number of tracks:40
Sectors per track:10
Bytes per sector:256
Bytes per disc:102,400
Maximum files per disc:31
Data transfer rate from Basic:330bytes/s
Assignment on OpenOut:64 sectors
Concurrent open files:5
Memory available:

Modes 0, 1, 2	5,888bytes
Mode 3	9,984bytes
Mode 4,5	16,128bytes
Mode 6	18,176bytes
Mode 7	25,344bytes

Tape programs

This situation will continue until Break is pressed, which will return the system to disc operation. It is assumed that mode 7 is used during the Loading, and that the program will in fact fit into memory using this mode under the disc system. If it will not there is little that can be done.

To install the program, enter it under Dos and Save the source file with a suitable name, for example:

```
>SAVE "MOVE.PR"
```

Now Run the program, which will locate the machine code starting at 0900 hex, the RS-423 transmit buffer. It is now necessary to save the program in executable form on the disc, so

```
>*SAVE "MOVE" 0900 094A
```

User programs can then be Loaded from a disc and shifted with the command:

```
>*Move
```

which will instantly shift the program and set the system to tape mode.

With very fast Chaining of programs and rapid reading and writing of chunks of data to temporary disc files, a completely different philosophy of program writing can be used. Menu options can be used to execute various sub-programs on disc. Long series of Data statements become redundant, as all the information can be held on a file and either read from disc when needed, or copied into an array for fast access.

To some extent this represents a parting of the ways between tape and disc users. Disc owners will want to exploit their new-found freedom, at the expense of making their programs unavailable to users of the snail-paced tapes.

Conclusions

- **Acorn has come up with an excellent operating system which operates more quickly than most micro disc systems.**
- **Far more operating-system commands are built in than in CP/M, where numerous commands exist as separate disc programs.**
- **It does not have all the facilities standard on mainframes, but busy programmers will soon find ways to enhance the operating system as supplied.**
- **Leasalink Viewdata has cleverly filled in a gap between the two Acorn/BBC products, providing and ideal system for home micro users.**
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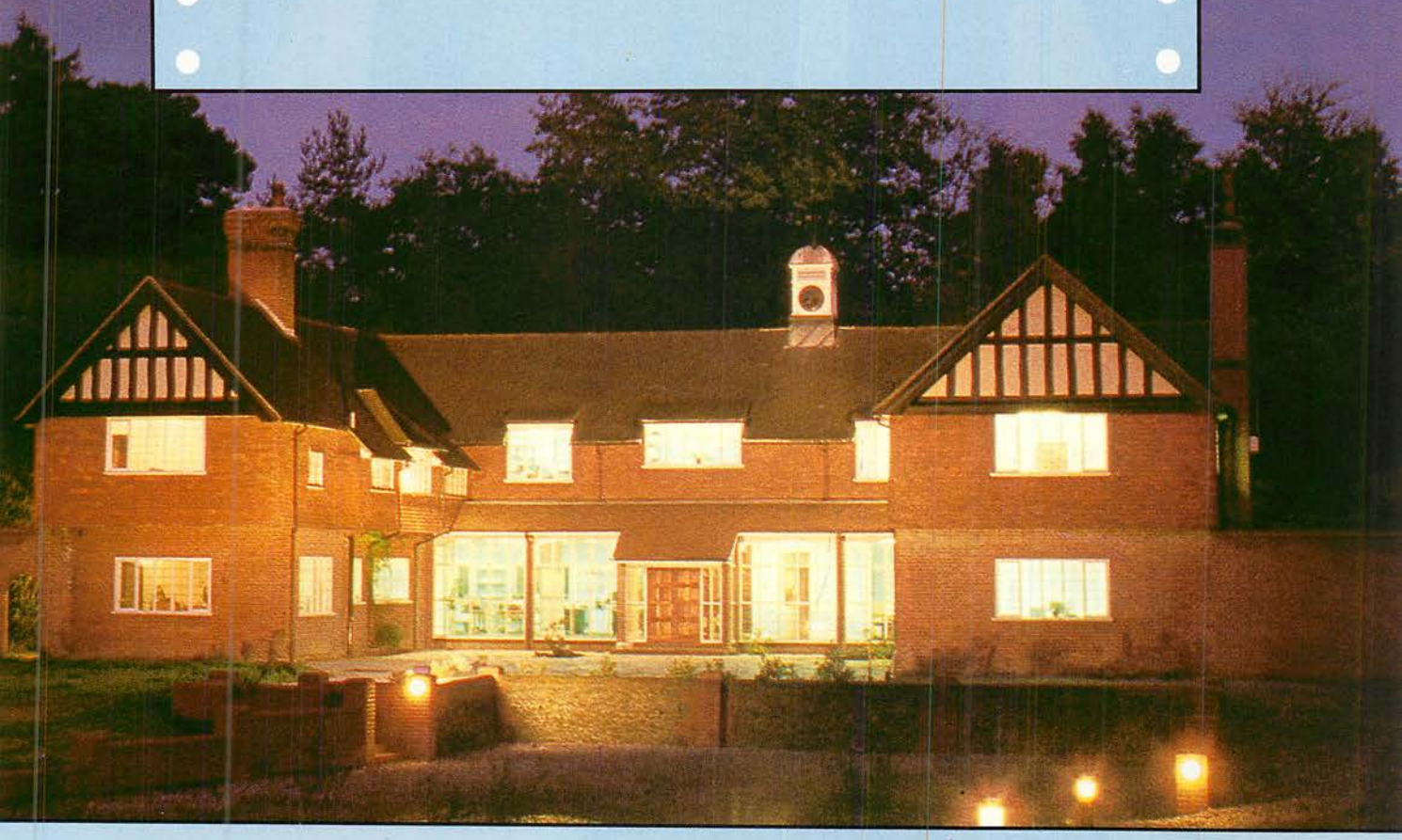

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ADCOMP X-80SP

Chris Bidmead tries out a dot-matrix printer which doubles as a graphics plotter.

DOT-MATRIX PRINTERS have a twofold advantage over daisywheel devices: they can be driven considerably faster, and are capable of producing almost infinitely variable character sets at the whim of internal or external software. As a logical development from this they ought to be able to plot graphs. The Adcomp X-80SP is the first low-cost dot-matrix printer we have seen designed to do this.

On the one hand the Adcomp is a fairly ordinary low-speed printer with one or two nice features; on the other it is a pretty sophisticated draftsman with the ability to construct graphs, circles, rectangles and so forth out of a few simple, high-level commands. The two personalities can be overlayed, producing graphs with explanatory text.

Rather remarkably, the text can climb axes vertically as well as horizontally, or run off at 45 degrees to the normal print direction. The very comprehensive software to support all this has obviously been put together by someone keen to emulate the traditional pen plotter, and a pretty good job they have made of it too.

Some good industrial design has gone into the rounded contours of the black case. From the look of it the Adcomp's origins could be Italian — not British, and certainly not American. In fact the Adcomp's home base is Munich, West Germany, and the review machine arrived directly from there because the manufacturer is still in the process of looking for a distributor in this country.

As a printer the Adcomp is well-behaved, with some clever software features like bidirectional printing and character-set swapping. Unfortunately PROM space, crowded no doubt with crafty software to support the plotting functions, seems to have left limited room for motion minimalisation. Working across the line the print head does the intelligent thing and avoids full carriage-returns if there is nothing at the beginning of the line to print. But it moves sluggishly into position, with no way of skipping quickly over spaces.

In the vertical direction it has a similar problem, being unable to wind rapidly past blank lines to get to the next piece of text. As a result the Adcomp goes about its business in rather a leisurely way, accompanied by some untuneful juddering as it cranks itself over blank lines. Our speed trials gave it a rating of 48 characters per second printing a page of solid text, a modest speed for a printer of this kind. Data exchange from the computer is smoothed by a 2K buffer, large enough to hold something like an ordinary A4 sheet of typed text.

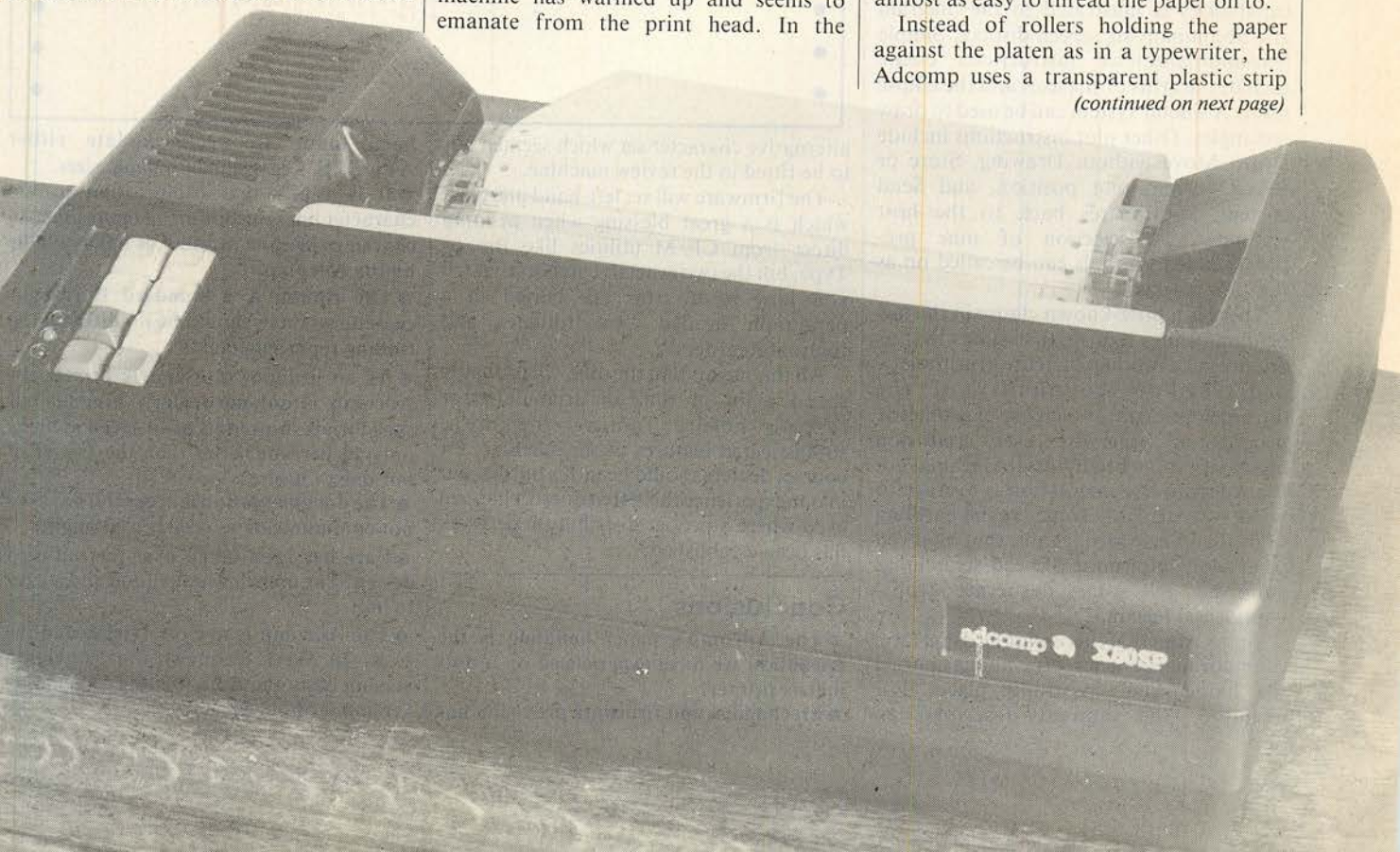
The printing action is quiet for a dot-matrix machine, but this advantage is rather spoiled by a persistent gnat-like whine that goes on the whole time once the machine has warmed up and seems to emanate from the print head. In the normal, noisy office environment this will not be noticed consciously, but it could still be deleterious as it seems to be tuned to headache-frequency.

The paper-transport system uses a pin-wheel platen rather than the more familiar tractor drive. The difference is that the tractor, at its name implies, pulls the paper from a position somewhere above the platen. The pin-wheel system consists of two circles of stubby spokes actually mounted on the platen, one on each edge of the paper. This approach has the advantage of being able to wind the paper backwards as well as forwards which, of course, is essential for plotting.

It will also save you paper. An ordinary tractor feed will require you to form feed an additional blank sheet before you can tear off the last sheet you printed, and needs to be left with a stretch of paper ahead of the print head in order to have something to pull on when it prints the next item. The pin-wheel system works much more like the simple friction feed of a typewriter, and is almost as easy to thread the paper on to.

Instead of rollers holding the paper against the platen as in a typewriter, the Adcomp uses a transparent plastic strip

(continued on next page)



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equipped with a serrated edge for tearing off sheets. A limitation is that the pin wheels cannot be brought close together to handle narrow paper, although a thumb-wheel adjustment is provided for fine tuning the width between the European and U.S. standards which are — wouldn't you know it — a couple of millimetres apart.

The paper-handling hardware is complemented by buttons on the top panel that enable you to move the paper up and down a line at a time or, by touching the same buttons lightly, to adjust the paper by fractions of a line. This is very useful for setting up top of form. Oddly, there is no front-panel button for sending a form feed.

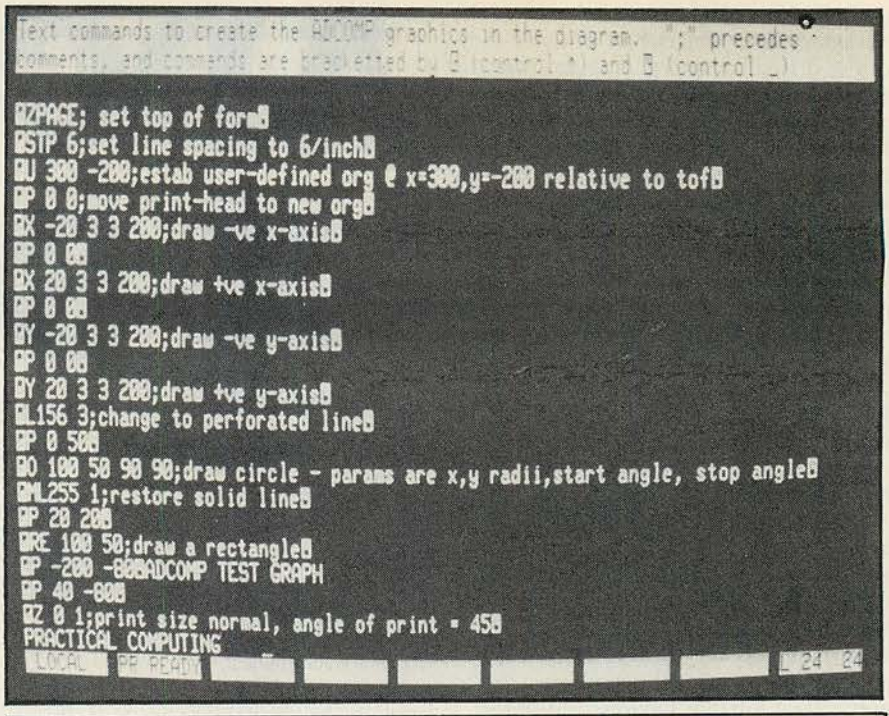
The basic Adcomp character set is clear, with true descenders; the print head is actually only eight needles deep, though nine seems to be becoming the standard. Characters can be expanded to double width with the command Escape-A. Instead of the more usual contraction to half width, allowing 130 characters to a line, the Adcomp only gives a choice of 80 or 96 characters per line.

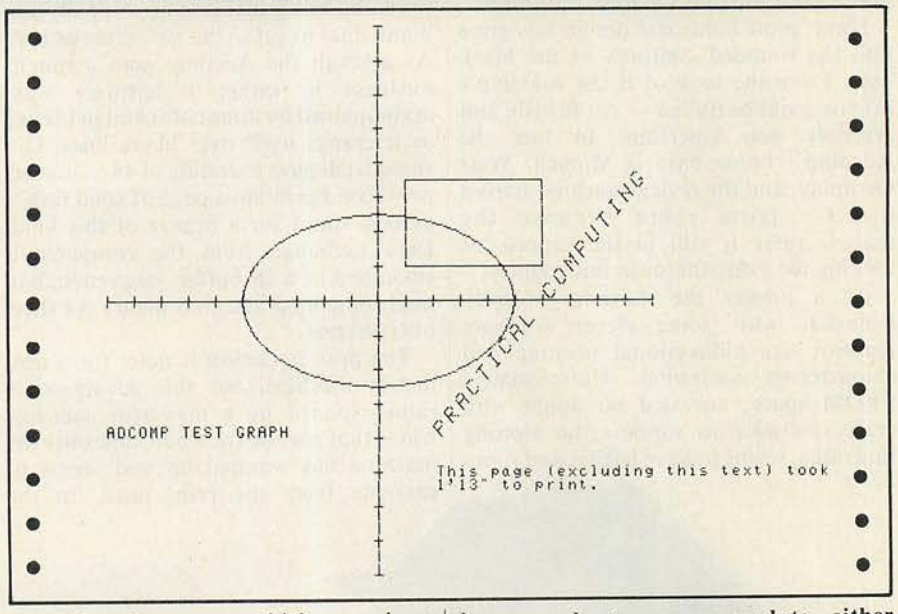
Auto-bidirectional printing is built in, and there is a hard switchable option to skip the paper over perforations, with a choice of paper lengths and bottom margins. One particularly interesting firmware dodge is a print formatter that works rather like Basic's Print Using statement. Figures or text can be right or left justified within defined fields; decimals can be aligned and padded with leading or trailing asterisks or zeros, and standard text can be incorporated as part of the format. Oh yes, and you can set up horizontal and vertical tabs by sending a string of values.

The graphics side of the machine's capabilities is illustrated in the diagram and accompanying screen display. Simple text-and-parameter instructions create each of the arms of the axes and the ellipse itself. A similar system can be used to draw rectangles. Other plot instructions include Draw, Move without Drawing, Store or Recall current plot position, and Send current co-ordinates back to the host computer. A selection of nine pre-programmed symbols can be called on as position markers.

There is a little-known clause in the law of diminishing returns that states that as features of a product increase in arithmetic progression, the quality of the documentation must increase in geometric progression otherwise user confusion increases exponentially. As these things go, the Adcomp documentation is average to good — apart from some crucial garbling of the baud-rate setting table that involved us in a long afternoon of head-scratching, followed by some desperate trans-continental telexing.

Apart from that there was the usual crop of minor inaccuracies, crucial facts buried like hidden clues in strange places. For example, the manual described an alternative character set which seemed not to be fitted in the review machine.





The firmware will set left-hand margins, which is a great blessing when printing direct from CP/M utilities like Pip or Type, but the two crucial sentences that tell you how to do this are buried in a paragraph headed "Co-ordinates and Internal Registers".

All this means that the user will probably spend a lot of time on trial-and-error testing before taming the more sophisticated features of the machine. Of course, dealers should bear this burden but in our experience this often doesn't happen even where a proper distribution network has been established.

Conclusions

- **The Adcomp's paper handling is the friendliest we have experienced on a dot-matrix printer.**
- **Mechanical and firmware provision has been made to accommodate either A4 or U.S. Legal standard paper sizes.**
- **It is a pity that compression to 130 character lines, an option on many other 80 character per line printers, is not available on the Adcomp.**
- **The ribbon is a standard Burroughs cassette so there should be no difficulty in finding replacements.**
- **As an ordinary dot-matrix printer the Adcomp is not particularly nimble: our speed trials showed its print speed as being only 12 percent better than the fastest of our daisywheels.**
- **The documentation is accurate, but does not communicate as clearly as it might.**
- **Care has been taken over the outward design. The machine looks good and is easy to use.**
- **The Adcomp is not yet available in the U.K. In West Germany the 80-column version costs about £1,100; the 132-column version is about £1,400.**

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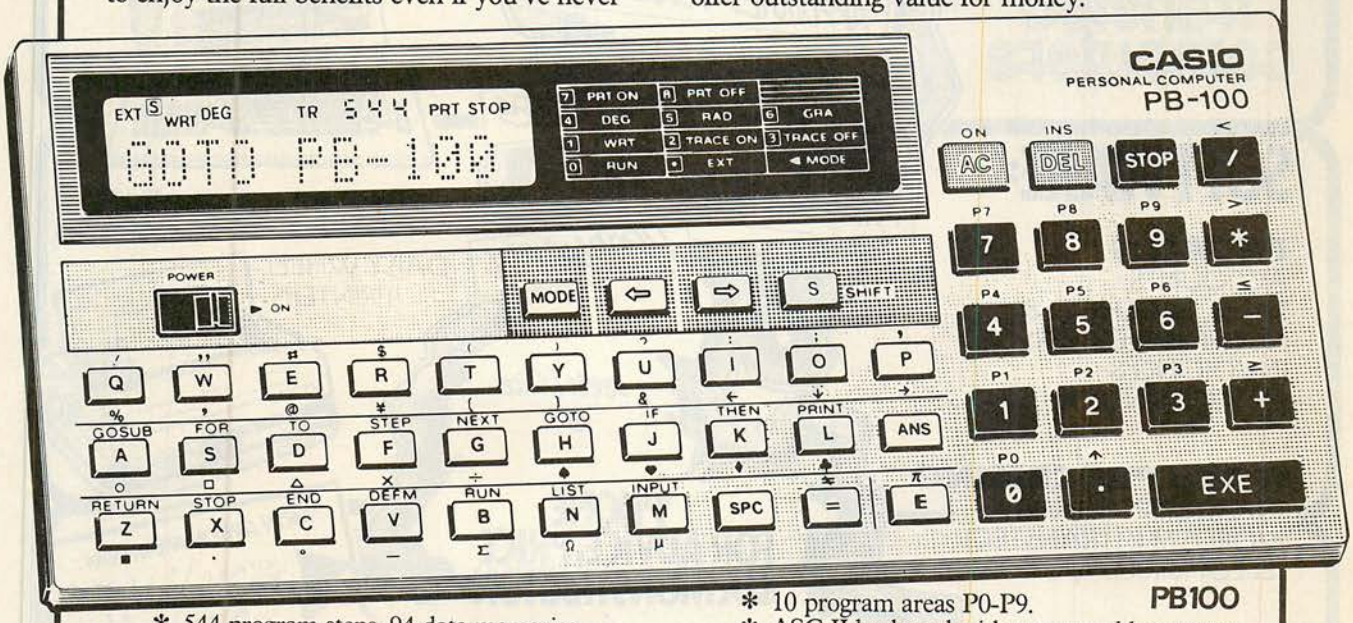

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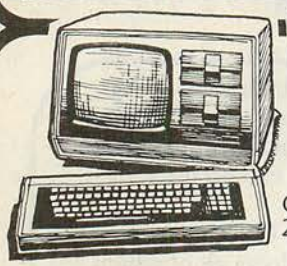

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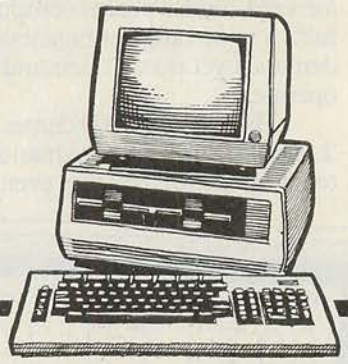

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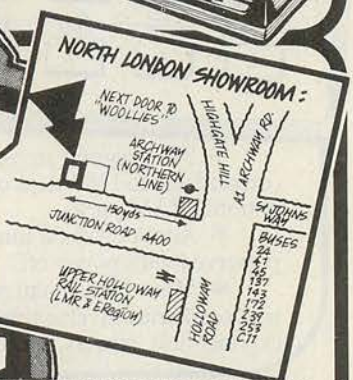

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Mode 7 colour on BBC Micro

Philip O'Shea explains how control codes can be used to manipulate eight-colour text and graphics in the BBC Micro's Teletext mode.

EVEN IF YOU DO NOT have a special teletext/viewdata receiver you will probably have seen the type of displays possible. It can quite easily be produced by the BBC Microcomputer, models A or B, in the Teletext mode, mode 7. Seven different colours can be mixed on the screen for text or graphics, double-height characters, coloured backgrounds, automatic symbol flashing, 80-by-75 low-resolution graphics and concealed symbols which can be revealed easily and quickly. Mode 7 is ideal for very long programs as it only uses 1K of screen memory.

The key to the working of this mode is control characters. Each of the 1,000 screen locations has one byte relating to it in the screen memory. A flashing, green letter. A, for example, is stored in its particular screen memory location in the same way as a steady, blue letter A on a yellow background. The difference is whether the computer has discovered previously, along the line the A is on, the control characters for the colours green or blue, to make characters flash or to produce a coloured background. When it does find these control characters a space on the screen at the place corresponding to where it found them in screen memory will appear, but if this space gets in the way it can be overwritten in a special manner.

The code numbers that can be placed in screen memory locations are shown in figure 1, along with their meanings. The characters corresponding to symbols are mainly normal ASCII codes, but the control codes from 128 to 159 are quite unique.

The modes referred to here have nothing to do with the screen modes of the BBC computer; everything goes on within screen mode 7. Neither do they apply to the whole screen, but only to the characters following them in screen memory up to another control character signalling the computer to change, or the end of the line they are on.

There are several complementary modes, alphanumeric or graphic, flashing or steady, for example. Different pairs may be intermixed — perhaps flashing graphic or alphanumeric — but the computer is always in just one mode of each pair.

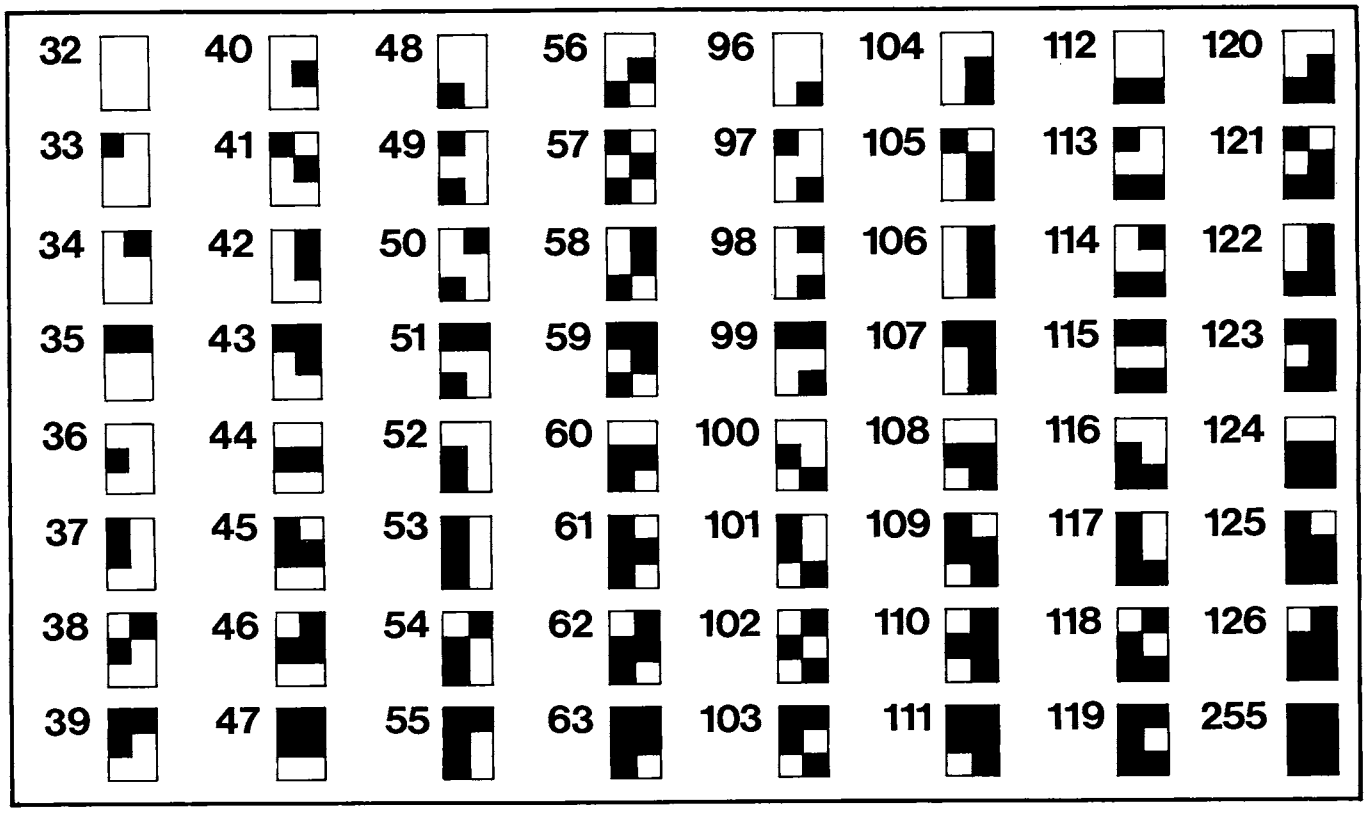
Alphanumeric mode is the default mode of the graphic/alphanumeric pair. Every new line starts in this mode, allowing all the symbols on the character chart in figure 1 to be used, including upper- and lower-case letters, numbers and punctuation signs. One control character does the job of entering alphanumeric mode and selecting a colour. Characters 129 to 135, labelled Alpha Red to Alpha White, are used to select this mode and the appropriate colour.

To print a red word on the screen, character 129 will have to be printed before the word. The command

```
PRINT CHR$ (129);
```

will do this, but VDU 129 means exactly the same thing.

(continued on page 85)



0	Nul	80	P
1		81	Q
2		82	R
3		83	S
4		84	T
5	ENQ	85	U
6		86	V
7		87	W
8	BS	88	X
9	HT	89	Y
10	LF	90	Z
11	VT	91	←
12	FF	92	½
13	CR	93	→
14		94	↑
15		95	#
16		96	-
17	DC1	97	a
18	DC2	98	b
19	DC3	99	c
20	DC4	100	d
21		101	e
22		102	f
23		103	g
24	Cancel	104	h
25		105	i
26		106	J
27	ESC	107	k
28		108	l
29		109	m
30	C Home	110	n
31		111	o
32	Space	112	p
33	!	113	q
34	"	114	r
35	£	115	s
36	$	116	t
37	%	117	u
38	&	118	v
39	'	119	w
40	(	120	x
41	)	121	y
42	*	122	z
43	+	123	¼
44	,	124	‖
45	—	125	¾
46	.	126	÷
47	/	127	←
48	0	128	Nul
49	1	129	Alpha Red
50	2	130	Alpha Green
51	3	131	Alpha Yellow
52	4	132	Alpha Blue
53	5	133	Alpha Magenta
54	6	134	Alpha Cyan
55	7	135	Alpha White
56	8	136	Flash
57	9	137	Steady
58	:	138	End Box
59	;	139	Start Box
60	<	140	Normal Height
61	=	141	Double Height
62	>	142	
63	?	143	
64	@	144	Dle
65	A	145	Graphics Red
66	B	146	Graphics Green
67	C	147	Graphics Yellow
68	D	148	Graphics Blue
69	E	149	Graphics Magenta
70	F	150	Graphics Cyan
71	G	151	Graphics White
72	H	152	Conceal
73	I	153	Contiguous Graphics
74	J	154	Separated Graphics
75	K	155	
76	L	156	Black Background
77	M	157	New Background
78	N	158	Hold Graphics
79	O	159	Release Graphics

Codes 32 to 63 and 96 to 127 are replaced by graphics in graphics mode.
Codes 160 to 254 are repeats of codes 32 to 126.

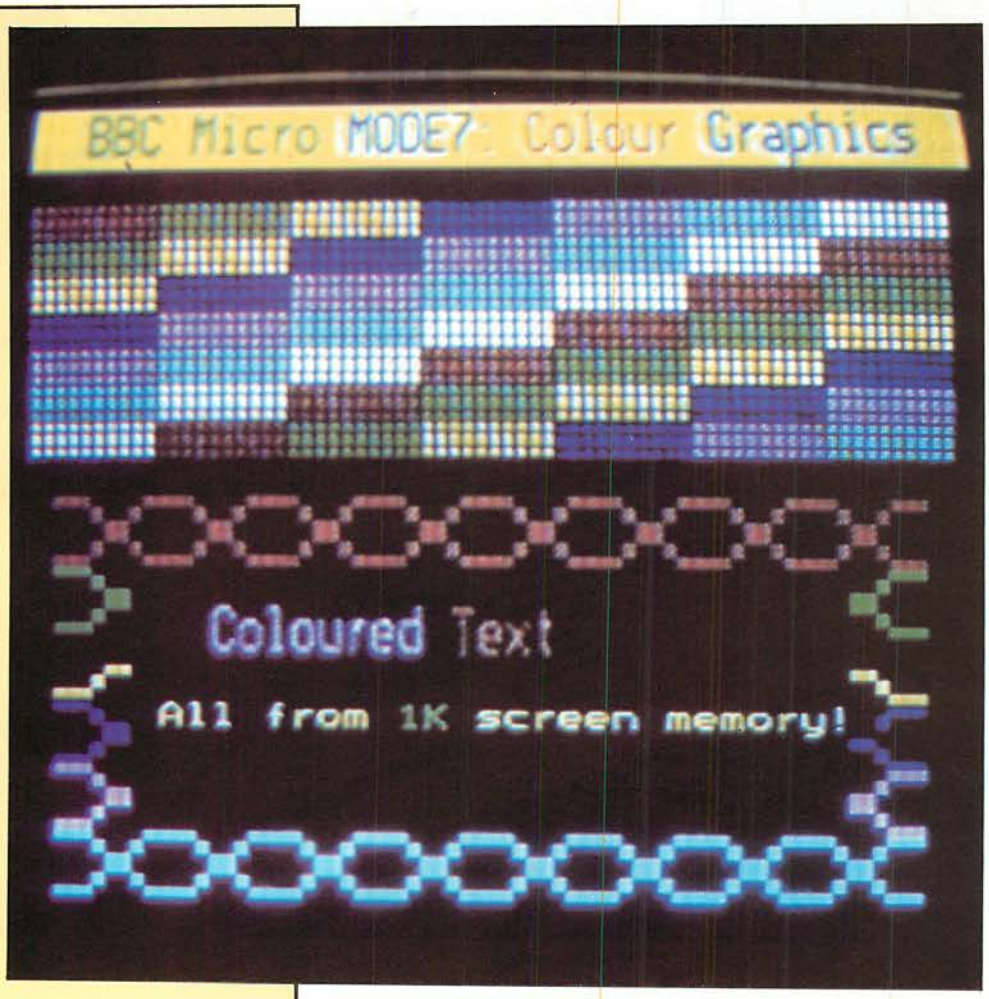


Figure 1 (left). Codes and characters available in alphanumeric mode; codes above 128 are control characters. Figure 2 (facing page). Codes and characters available in graphics mode.

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BM. 6.	18.7	23.5	35.4
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MODE 7 COLOUR

(continued from page 82)

Try the following line in mode 7:

PRINT CHR$ (129); "HELLO"

The word will be printed in red with a blank space on the far left; nothing can be done about this in alphanumeric mode. It is not usually a handicap: different words can still be in different colours if no space is included at the end of the first word or the start of the second. For example

PRINT CHR$(129);"HELLO";CHR$(130); "THERE"

Graphics mode is the complementary mode to alphanumeric. It is selected in the same way, the colour being defined using characters 145 to 151, labelled Graphics Red to Graphics White. In this mode, a different character set is available with the columns indicated in figure 1 replaced by the graphics characters of figure 2. Upper-case letters — known as "blast through" alphabetic characters — are still available.

Each of the graphics characters is made up of six small squares — see figure 3. To choose a particular character, add up the numbers in brackets found in each square that must be lit up on the screen. Add 160 to the total for the code that must be printed on the screen.

For example, the shape in figure 4 is one character high and four long, as shown by the arrows. A quick calculation shows the four numbers to be 250, 171, 167 and 245. One way to print out the shape would be:

PRINT CHR$(151);"z + 'u"

The ASCII codes for z, +, ' and u in figure 1 are the same as the four calculated numbers for the shape. While the computer thinks it is printing these symbols, the CHR$(151) which put it in graphic mode and selected the colour white has made it swap character sets so that the required shape appears on the screen.

A shorter method, and an easier one if you only have four numbers in front of you is:

VDU 151,250,171,167,245:PRINT

The Print command makes the cursor go down a line, as the VDU command would have left it immediately after the printed shape and the graphics form of the > cursor prompt.

The character 151 must be left on the screen. If at any time it is changed, and a different code written in the same position, the line will revert to alphanumeric mode and the symbols z + 'u will be displayed even if the other four symbol codes are left. To test this, type VDU 30, which moves the cursor to the top-left position. Press and hold down the Return key and allow it to repeat, which will have the effect of writing a > symbol into the left-hand column of the screen as it moves down. When it is level with the shape on the screen the graphics revert to alphanumeric because the screen is continually being scanned, many times a second, and the screen memory is printed as it goes.

Listing 1.

```
    5 MODE7:VDU 23;8202;0;0;0;
   10 FORI=0TO24
   20 PRINTTAB(0,I);CHR$(146);
   30 NEXTI:VDU30
   40 FOR A=0 TO 360
   50 Y=37+SIN(RAD(A))*35
   60 X=2+(A/360)*75
   65 PROCplot(X,Y)
   70 NEXTA
   80 GOTO 80
10000 DEF PROCplot(X,Y)
10010 SX=INT(X/2):SY=24-(INT(Y/3))
10020 SL=HIMEM+(40*SY)+SX
10030 EX=?(SL)-32
10035 IF EX=223 THEN EX=95
10040 YM=Y MOD 3:IF YM=0 THEN VL=16 ELSE IF
      YM=1 THEN VL=4 ELSE IF YM=2 THEN VL=1
10050 IF (X MOD 2)=1 THEN VL=VL*2 :IF VL=32
      THEN VL=64
10060 NW=EX OR VL
10065 NW=NW+32:IF NW=127 THEN NW=255
10070 ?(SL)=NW
10080 ENDPROC
```

A change in the screen memory at a particular place will not be displayed on the screen until the scan comes round to it once more after a fraction of a second's delay. As soon as the scan meets the line which has been changed, the computer has no reason to go into graphics mode and the line is displayed as for normal ASCII code.

A very long program which uses up too much memory for high-resolution graphics may have to use these graphics as an output. A routine to plot points on an 80 by 75 grid is shown in the listing along with a program to plot a sine wave. Lines 5 to 80 plot the graph, calling the plotting routine at line 65. The second half of line 5 is a useful command to get rid of the flashing cursor that would otherwise be present constantly; the cursor is reinstated by redefining the screen mode.

The routine uses the fact that each lit square of a graphics character can correspond to a binary bit to make up one binary number, from which the ASCII code can easily be found. This is another version of the method used earlier to draw a shape. Lines 10 to 30 produce character 146 all the way down the left column of the screen, so the lines are all in graphics mode and produce a green display.

After running the program, press Escape and again press and hold down the Return key. As it repeats, the display again reverts to alphanumeric characters. From the memory maps in the User Guide you can see that the screen memory is found just above Himem, which is a pseudo-variable in Basic. The screen memory can therefore be addressed directly — a process referred to as Peeking and Poking in other machines. A fast version of

PRINT TAB(x,y);"A"

or

PRINT TAB(x,y);CHR$(65)

and one which does not interfere with the position of the cursor is

?(HIMEM + (40*y) + x) = ASC("A")

The contents of the memory location on the left become 65, the ASCII code of A. The x,y co-ordinates can be checked by

L = ?HIMEM + (40*y) + x)

This capability is used in the program. The variables for it are:

- X — Y value, 0-79, with which the routine is called.
- Y — Y value, 0-74, with which the routine is called.
- SX — X value, 0-39, of the appropriate screen position.
- SY — Y value, 0-24, of the appropriate screen position.
- SL — memory location of the appropriate screen position.
- EX — contents of location SL, the ASCII code of the existing character on the screen
- YM — Y value, 0-2 of the appropriate small square within the screen position
- VL — the number 1,2,4,8,16 or 64, corresponding to the square that must be lit up, as in figure 3
- NW — the ASCII code of the graphics character that must replace the existing character on the screen; equal to the existing plus that of the square being lit up.

(continued on next page)

MODE 7 COLOUR

(continued from previous page)

Due to a quirk of the character set, codes 160 to 255 are repeats of codes 32 to 127, except for the last character. Graphics character 127 is blank, though to match those from 32 to 126 it should be a full square. Character 255, at the end of the 160 to 254 sequence is a full square, so the sequence fits with the given rules, which is why 160 is added to the total when choosing a character; 32 could be added instead, but the sequence would be broken for a full square. So do the 32 to 126 graphic characters have any uses?

Ellipse and circle

There is a good reason for using them in the program to draw a curve: a clear screen is automatically filled with spaces, character 32. When plotting a point within a screen location, the character to be plotted is combined with what is already there so if a space, character 32, is found it fits in neatly with the graphics sequence as the code for a graphics blank. Special provision is made at lines 10035 and 10065 for the case of a full square. To make the program draw a circle, change line 60 to:

```
60 X = 40 + COS(RAD(A)) * 35
```

The 35 at the end of lines 50 and 60 specifies the radius of the circle. Two different values in the positions draw an ellipse or neutralise the distorting effect of the small squares being slightly rectangular. Do not increase them by more than 35.

Background colours may be chosen in graphics or alphanumeric modes. Printing control character 157 will set the background colour to the last specified text/graphics colour on the same line. Default is white.

The coloured background extends from the control character to the end of the line. A colour change will then have to be made so that the words or pictures do not appear in the same colour as the background colour. After the message the background colour to the end of the line can be reset to black with character 156. Try:

```
VDU 129,157,135:PRINT"TEXT"
  ;CHR$(156)
```

Character 129 selects alphanumeric mode and colour red. Character 157 produces the background, red in this case as the last colour was red. Character 135 changes colour for the letters to white.

As each control character occupies a memory location, the cursor will be three spaces out. Figure 5a shows what these three spaces look like to the computer and the user. Two spaces have been put at the beginning of the red background, so the message printed has two spaces at the end to balance it. Character 156 reverts the display to normal black background. The line now looks like Figure 5b.

Flashing mode is one of the complementary pair, flashing and steady. Character 137 initiates flashing mode, and 136 makes it steady again. Control characters occupy a space so, as with colours, a whole word can be made to flash using control characters instead of normal spaces to separate it from words behind and ahead. It only applies up to the end of the line it occurs on. An example, try:

```
PRINT"THE ALIEN IS";CHR$(136);
  "DEAD";CHR$(137);"NOW."
```

The word "DEAD" will flash steadily.

Graphics characters can be used to produce large letters for titles, and often are with teletext or viewdata. The double-height mode can be used to make letters, numbers or graphic characters twice as high without affecting their width.

Double-height mode is initiated with character 141; the following line becomes reserved for the lower half of the letters. Printing a message produces the top half of the display and printing the same on the line below gives the lower half, so it is convenient to have a For-Next loop which operates twice. Try:

```
FOR I = 1 TO 2:PRINT CHR$(141);
  "LARGE Letters":NEXT I
```

The top line can also be used for normal letters following character 140, which turns off the double-height mode. It will only work on the top row, as the bottom is reserved for the lower half. Trying to print the letters below does no damage — they just do not print — so they can go in with the loop:

```
FOR I = 1 TO 2: PRINT CHR$(141);
  "LARGE";CHR$(140);"SMALL";CHR$
  (141);"LARGE":NEXT I
```

If you are producing pictures or patterns in the graphics mode, space left by a control character can be a problem. Graphics hold mode allows it to be easily overcome. Character 158 starts this mode, which holds in memory the last graphics character printed on the line. Then every time a control code is met along the line the character will appear in the current colour in the space.

To produce a line a colours with no spaces in between, try:

```
PRINT CHR$(158);:FOR I = 145 TO 151:
  PRINT CHR$(I);"";;;"";:NEXT I:PRINT
```

There are two blank spaces on the left to accommodate the control character 158 and the first colour, 145. Although only three graphics characters were printed in each band, four actually appear as they are also written at the position of the colour change. At the colour-change position itself the character does not appear in the colour being changed to, but in the preceding one. Thus the colour-change position is on the right of each band.

Mixed modes

The rightmost band is only three characters long as it is not followed by a colour change or other control character. Character 159 turns off graphics hold mode before the end of each line.

Printing character 152 before a line will conceal what is on it as far as any other control character. It will be stored in screen memory, accessible by the function described earlier to Peek the screen, but will not be displayed. To make it appear instantly, another character must be put in the location of character 152. Character 128, the flashing control character or a change of colour are all suitable.

The modes described here can all be mixed. For example, you can have coloured, double-height backgrounds with graphics characters, concealing coloured flashing words or holding double-height flashing graphics. You can separate the graphics characters with character 154, so that they do not touch each other, and bring them back together with character 153.

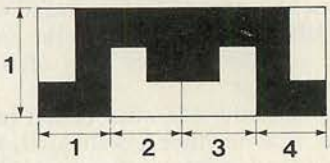
B1 (1)	B2 (2)
B3 (4)	B4 (8)
B5 (16)	B6 (64)

Example:

Code=2+8+16+160=18

Figure 3.

Figure 4.



A

Computer;	129	157	135
User;	Black	Red	Red

B

Computer;	129	157	135	84	69	88	84	32	32	156	32	32	....
User;	Black	Red	Red	T	E	X	T	Red	Red	Black	Black	Black	....

Figure 5.

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• Circle No. 149

Multiple blocking

Frank van der Riet has come up with a variation of the economical method for storing high-resolution graphics with which you can save yet more memory.

IN HIS ARTICLE on storing high-resolution graphics — *Practical Computing* November 1982, page 96 — Graham Kirby provides an interesting explanation of the technique of multiple blocking. The method certainly is useful, but it does have one disadvantage.

As the number of lit pixels increases so, very rapidly, does the amount of storage space, even when most of the lit pixels are joined in one block. The cause is the method of going to a lower level when a lit pixel is found. If a program has to store an eight-by-eight pixel block, with all the pixels lit, it needs 85 bits: one for the whole block, four for the sub-blocks, 16 for the sub-sub-blocks, and 64 for each separate pixel. The conventional method only needs 64 bits.

When one-half of the screen is lit, you only save 30 percent of storage space compared to the conventional method, so there has to be a better way. Graham Kirby's listing of the block procedure in figure 12 provides for only one bit to be stored at a time. Depending on whether a block is lit or not, a 1 or a 0 is stored. If two bits at a time are stored, it can be changed to:

00 when all the pixels in a block are lit
01 when all the pixels in a block are unlit
10 when a block contains lit and unlit pixels.
11 is free, and so this can be used for error checks in the readblock procedure.

This may seem strange, but if you take another look at the eight-by-eight pixel block, you can see that now it only takes two bits to store it, and it does not matter whether all the pixels are lit or unlit. If you store a picture two bits at a time, you will have to reproduce it the same way. A little adjustment in the read(thing) procedure is then required. Thing now has to get a two-bit value instead of one bit.

A procedure has to be added to the block procedure to check if all the pixels are lit. Consequently you may have to scan several blocks twice. If you think that this will take too much time, you could combine the new checking procedure with the blockempty procedure. You will then need two Boolean operations to decide whether to store 00, 01 or 10. The combined procedure has to be part of the doblock procedure itself, because a subroutine cannot pass down two Booleans to the main procedure.

Another procedure has to be added to the readblock procedure. It has to light all the pixels in a block when thing is 01. Neither the doblock nor readblock procedures now need the blocksize check. The revised procedures are shown in listings 1 and 2. If you cannot store, read and process two bits at a time, it is not difficult to split them up for use one bit at a time.

Suppose you want to store a chessboard, 64 small surfaces of which 32 are lit and 32 unlit. When you vary the size of the chessboard from eight by eight pixels to 1,024 by 1,024 pixels, the number of bits required for conventional storage increases enormously. Table 1 shows the space saved by the multiple-blocking method.

Though the figures appear to suggest that the amount of storage space occupied to store a picture with two-bit multiple blocking is independent of the resolution of the picture, that is only true when the picture remains the same. It really depends upon the number of blocks with all the pixels lit or unlit.

This method can also be adapted to colour pictures by replacing the two-bit code by a colour code. When you have eight colours, you will need a four-bit colour code to allow for a code for a block with all pixels unlit and one for a block with more than one colour.

Further adjustments are concerned with store and read (thing) to allow them to handle four-bit codes. Blockempty and blockfull have to be changed into a procedure that recognises the colour of the first pixel in a block, then checks all the other pixels for their colour. The right colour code then has to be stored. Clearblock and fillblock have to be changed into a procedure that recognises the code and that can send the main program to the next level, or fill the right block with the right colour.

A disadvantage of two-bit multiple blocking is that it is an inefficient method of storing pictures that consist of many thin lines all over the screen. It is also difficult to combine it with other methods like frame or line storage.

Listing 1.

```
procedure doblock(blocksize,cornerx,cornery:integer);
var smallblock:integer;
begin
    if blockempty(blocksize,cornerx,cornery)
    then store(00)
    else if blockfull(blocksize,cornerx,cornery)
        then store(01)
        else begin
                store(10);
                smallblock: = blocksize/2;
                doblock(smallblock,cornerx,cornery + smallblock);
                doblock(smallblock,cornerx + smallblock,cornery + smallblock);
                doblock(smallblock,cornerx,cornery);
                doblock(smallblock,cornerx + smallblock,cornery)
            end
end;
```

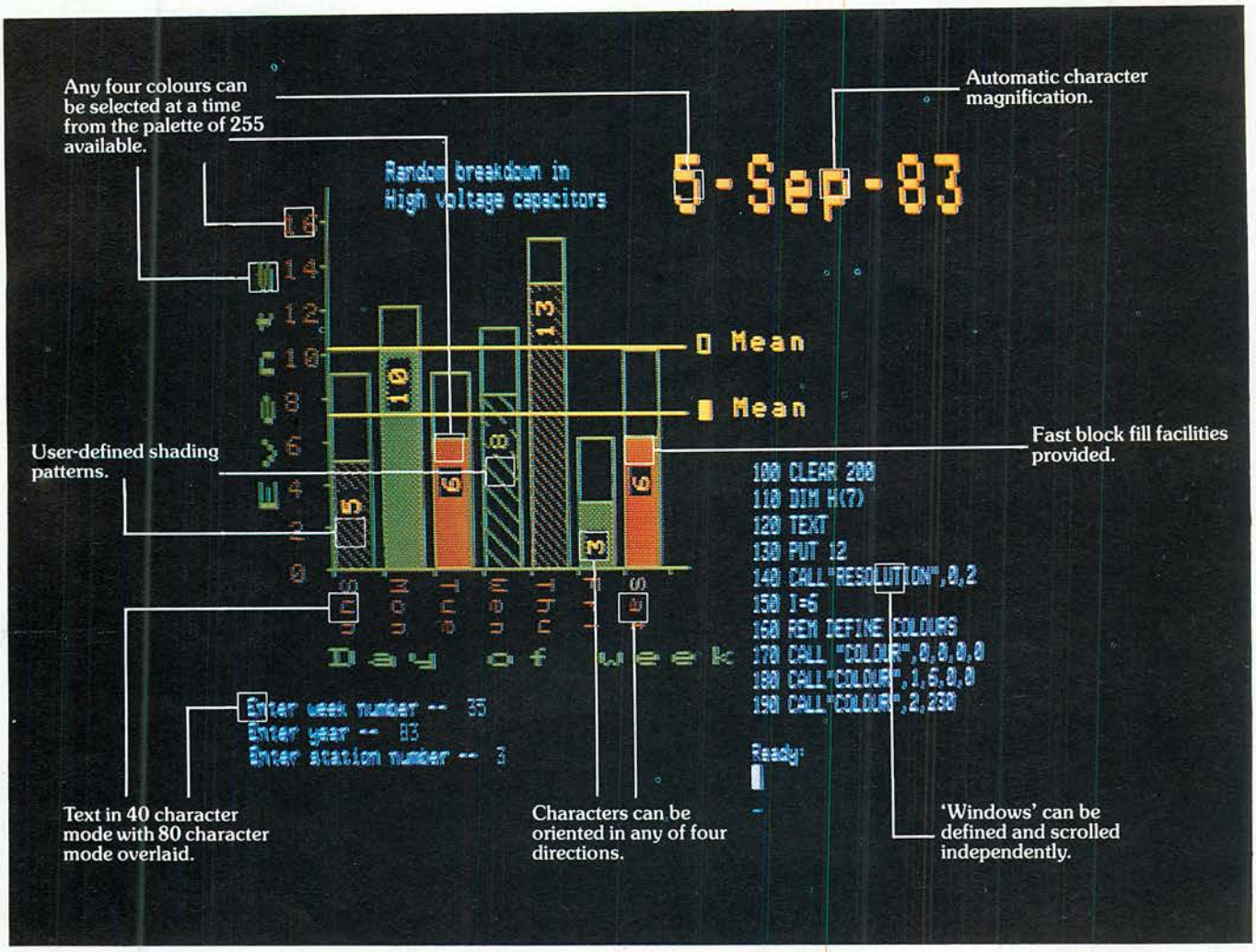
Listing 2.

```
procedure readblock(blocksize,cornerx,cornery:integer);
var thing,smallblock:integer;
begin
    read(thing);
    if thing = 00
    then clearblock(blocksize,cornerx,cornery)
    else if thing = 01
        then fill block(blocksize,cornerx,cornery)
        else beginsmallblock: = blocksize/2;
                readblock(smallblock,cornerx,cornery + smallblock);
                readblock(smallblock,cornerx + smallblock,cornery + smallblock);
                readblock(smallblock,cornerx,cornery);
                readblock(smallblock,cornerx + smallblock,cornery)
            end
end;
```

chessboard size (pixels)	conventional storage space (bits)	multiple-blocking storage space (bits)	percengage saving	two-bit multiple-blocking storage space in bits	percentage saving
8 × 8	64	85	– 32,8	170	– 165,6
32 × 32	1,024	725	29,2	170	83.4
128 × 128	16,384	10,965	33,1	170	99.0
1,024 × 1,024	1,048,576	699,093	33,3	170	99.98

Table 1. Storage space required for eight-by-eight chessboards of increasing size.

• Circle No. 150



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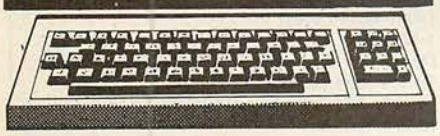
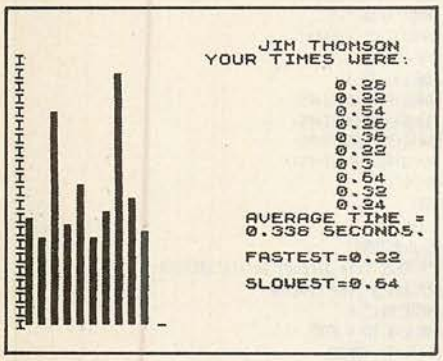


Reaction timer

WRITTEN FOR the ZX-81 this program by Eric Smith of Grangemouth, Stirlingshire uses 3K of memory. It times the reactions of



contestants 10 times, then displays the average, fastest and slowest time, as well as a plot of the contestants' names and times.

Number formatter.

```
9000 LET A$="LEN (STR$ (INT N))"
9010 LET N$=("**********"+(STR$
N)+(".00000000")((N<>INT N)+1 TO
 ))(VAL A$+11-D1-(ABS N<.1) TO V
AL A$+11+D2-(ABS N<.1)-(D2=0))
9020 RETURN
```

Reaction timer.

```
  10 REM **REACTION COUNTER**
  20 PRINT "[redacted]"
  30 PRINT AT 1,5;"[redacted]"
  40 PRINT
  50 PRINT "IN REACTION COUNTER
THE          COMPUTER DISPLAYS A
WORD ON THE SCREEN AND MEASURES
YOUR         REACTION TIME."
  60 PRINT "THIS IS DONE TEN TIM
ES AND AN    AVERAGE TIME IS GIVE
N."
  70 PRINT "WHEN THE WORD ""STAR
T"" APPEARS   ON THE SCREEN PRES
S ANY KEY TO  STOP THE CLOCK."
  80 PRINT AT 21,0;"[redacted]
[redacted]"
  90 IF CODE INKEY$<>118 THEN GO
TO 90
 100 CLS
 110 LET H=0
 120 LET L=999
 130 LET AV=0
 140 DIM T(10)
 150 FOR A=1 TO 10
 160 FOR W=1 TO INT (RND*300)
 170 IF INKEY$<>"" THEN GOTO 200
 180 NEXT W
 190 GOTO 250
 200 PRINT AT 5,0;"WILL YOU PLEA
SE STOP CHEATING.."
 210 FOR E=1 TO 20
 220 NEXT E
 230 PRINT AT 5,0;"
 240 GOTO 160
 250 PRINT AT 12,10;"[redacted]"
 260 POKE 16437,255
 270 POKE 16436,255
 280 IF INKEY$="" THEN GOTO 280
 290 LET R=PEEK 16436
 300 LET P=PEEK 16437
 310 LET T=((254-R)+256*(255-P))
/50
 320 PRINT AT 12,10;"      ";AT 0
,0;"
    ";AT 0,0;"YOUR TIME WAS ";T;"
SECONDS"
 330 LET T(A)=T
 340 IF H<T THEN LET H=T
 350 IF L>T THEN LET L=T
 360 LET AV=AV+T
 370 NEXT A
 380 CLS
 390 PRINT "PLEASE ENTER YOUR NA
ME.(NOT MORE THAN 12 LETTERS)"
 400 INPUT A$
 410 IF LEN A$>12 THEN GOTO 380
 415 CLS
 420 PRINT AT 0,19;A$
 430 PRINT AT 1,15;"YOUR TIMES W
ERE:"
 440 FOR A=1 TO 10
 450 PRINT AT A+2,25;T(A)
 460 NEXT A
 470 PRINT AT 13,18;"AVERAGE TIM
E =";AT 14,18;AV/10;" SECONDS."
 480 PRINT AT 16,18;"FASTEST=";L
;AT 18,18;"SLOWEST=";H
 490 FOR A=1 TO 21
 500 PRINT AT A,0;"I"
 510 NEXT A
 520 FOR A=1 TO 15
 530 PRINT AT 21,A;"-"
 540 NEXT A
 550 FOR X=1 TO 10
 560 FOR Y=1 TO T(X)*(38/H)
 570 PLOT X*2,Y
 580 NEXT Y
 590 NEXT X
 600 PRINT AT 21,12;"[redacted]"
 610 IF INKEY$="Y" THEN GOTO 640
 620 IF INKEY$="N" THEN STOP
 630 GOTO 610
 640 PRINT AT 21,12;"
    "
 650 LPRINT "REACTION TIMER BY E
.SMITH"
 660 LPRINT
 670 COPY
 680 STOP
```

Number formatter

A THREE-LINE SUBROUTINE to format a number on the ZX-81 comes from P A Smith of Dundee. The number stored as the variable N is converted to a string N$. The positions before and after the decimal point are specified by the variables D1 and D2 respectively, which can have values from zero to 10 or 8 respectively. The decimal point is suppressed if D2 is set to zero.

The sign is printed for a negative number, and occupies one printing position. There is no check on whether the number can be printed in the space available.

The listing shows a string of asterisks in line 9010; they should be replaced by spaces.

Determinant evaluation

A BASIC PROGRAM to evaluate a determinant by the method of pivotal condensation has been submitted by Alan Mackay of London. The method is to find the largest term in the array and to reduce other terms in the corresponding column to zero by subtraction of appropriate multiples of other columns.

The program may be used as the basis of a subroutine for longer programs. It is convenient for versions of Basic which do not have the matrix operations which were seen as an essential feature of the original Dartmouth College Basic.

On a ZX Spectrum approximate times for determinants of order N were:

N = 5, 7 s.
N = 10, 39 s.
N = 20, 350 s.
N = 40, 2,275 s.

No doubt the program could be packed more tightly, if necessary, but at present it simply follows the standard procedure.

Determinant evaluation.

```
100  REM read in test data
110  DIM D(8,8)
120  LET N = 4
130  FOR I = 1 TO N
140  FOR J = 1 TO N
150  READ D(I,J)
160  NEXT J
170  NEXT I
180  GOSUB 1000
190  STOP
200  DATA 2,9,9,4,2,-3,12,8,4,8,3,-5,1,2,6,4
210  REM determinant for test data is 147

1000 REM calculation of determinant by pivotal condensation
1010 REM det. of order N is in D(N,N). Result is in S
1020 REM matrix is destroyed. Uses A(N*N),B,I,J,A,P,Q,V,W. N is altered.
1030 DIM A(64)
1040 LET S = 1
1050 REM begin
1060 LET B = 0
1070 REM find largest element = pivot = D(P,Q)
1080 FOR I = 1 TO N
1090 FOR J = 1 TO N
1100 LET A = ABS(D(I,J))
1120 IF A < B THEN GOTO 1160
1130 LET P = I
1140 LET Q = J
1150 LET B = A
1160 NEXT J
1170 NEXT I
1180 REM multiply by largest element with sign W as plus 1 if P+Q is even
1181 REM and minus 1 if odd
1188 LET W = INT((P+Q)/2)
1189 LET W = 1 + 4*W -2*(P+Q)
1190 LET S = S*D(P,Q)*W
1200 IF S = 0 THEN GOTO 1440
1210 LET V = 1
1220 REM reduce other terms to zero by subtraction of
1221 REM columns of pivot
1230 FOR I = 1 TO N
1240 IF I = P THEN GOTO 1320
1250 FOR J = 1 TO N
1260  IF J=Q THEN GOTO 1310
1270 LET D(I,J) = D(I,J)-D(P,J)/D(P,Q)*D(I,Q)
1280 LET A(V) = D(I,J)
1290 LET V = V+1
1300 REM run out non-zero elements into det. of lower order
1310 NEXT J
1320 NEXT I
1330 LET N = N-1
1340 IF N = 0 THEN GOTO 1440
1350 LET V = 1
1360 FOR I = 1 TO N
1370 FOR J = 1 TO N
1380 LET D(I,J) = A(V)
1390 LET V = V+1
1400 NEXT J
1410 NEXT I
1420 REM repeat until det. has order 1
1430 GOTO 1060
1440  PRINT "determinant="; S
1450 RETURN
```

```
1300 REM Add 'CES' suffix to filename
1310 F$=F$+".CES"
1320 REM Check another program is not being erased
1330 IF LOOKUP(F$)<>0 THEN GOSUB 2510:GOTO 250
1340 REM Output the program
1350 CREATE£10,F$
1360 PRINT£10,X
1370 FOR P=1 TO X
1380 IF PR$(P)="" THEN 1440
1390 REM If quotation marks are used change them to apostraphies
1400 TV$=RIGHT$(PR$(P),LEN(PR$(P))-1)
1410 AV$="'":AV$=AV$+TV$
1420 TV$=LEFT$(AV$,LEN(AV$)-1):TV$=TV$+"'"
1430 PR$(P)=TV$
1440 PRINT£10,ID$(P)
1450 PRINT£10,IN$(P)
1460 PRINT£10,LA$(P)
1470 PRINT£10,PR$(P)
1480 NEXT
1490 CLOSE
1500 GOTO 1580
1510 REM Input a program
1520 ?:INPUT"Filename:",F$
1530 RESET
1540 REM Add 'CES' suffix
1550 F$=F$+".CES"
1560 REM Check that file exists
1570 IF LOOKUP(F$)=0 THEN ?"That file is non-existant":GOTO 250
1580 OPEN£10,F$
1590 INPUT£10,X
1600 FOR P=1 TO X
1610 INPUT£10,ID$(P)
1620 INPUT£10,IN$(P)
1630 INPUT£10,LA$(P)
1640 INPUT£10,PR$(P)
1650 IF PR$(P)="" THEN 1710
1660 REM If an apostraphy is found change it to a quotation mark
1670 TV$=RIGHT$(PR$(P),LEN(PR$(P))-1)
1680 AV$=CHR$(34):AV$=AV$+TV$
1690 TV$=LEFT$(AV$,LEN(AV$)-1):TV$=TV$+CHR$(34)
1700 PR$(P)=TV$
1710 NEXT P
1720 GOSUB 1900
1730 RETURN
1740 REM Erase program routine
1750 PUT 12:?"Enter passcode:":?:?
1760 ?"!!!!";:FOR W=1 TO 4:? CHR$(8);:NEXT
1770 FOR W=1 TO 4:A$=GET$():CD$=CD$+A$:?"!";:NEXT:?:?
1780 REM If passcode does not equal the proper passcode print error message
1790 IF CD$<>"KILL" THEN CD$="":?"You aren't authorised to erase a program":RETURN
1800 CD$=""
1810 ?:INPUT"Filename:",F$
1820 RESET
1830 REM Add 'CES' suffix
1840 F$=F$+".CES"
1850 IF LOOKUP(F$)=0 THEN ?:?"* File does not exist":RETURN
1860 ERASE F$
1870 RETURN
1880 REM List program if LI=1 then print the line numbers
1890 REM If LR=1 then print out on the printer
1900 IF X=0 THEN ?"* No program":RETURN ELSE PUT 19,12:?:?:IF LR=1 THEN ?"Program being printed":
     FOR P=1 TO X ELSE FOR P=1 TO X
1910 IF LI=1 AND LR=1 THEN LPRINT P;TAB(3); ELSE IF LI=1 THEN ? P;TAB(3);
1920 IF LR<>1 THEN 1950
1930 LPRINT ID$(P);TAB(17);IN$(P);TAB(33);LA$(P):IF PR$(P)<>"" THEN LPRINT" ";PR$(P)
1940 GOTO 1960
1950 ? ID$(P);TAB(17);IN$(P);TAB(33);LA$(P):IF PR$(P)<>"" THEN ?" ";PR$(P)
1960 NEXT
1970 LI=0:LR=0:PUT 17
1980 RETURN
1990 REM Print error message if there is no identifier
2000 IF LA$(G)="" THEN ?:?:?"* Missing identifier at line";G:GOTO 250
2010 REM Find the matching label
2020 FOR P=1 TO X
2030 IF ID$(P)=LA$(G) THEN IG=P:B=1
2040 NEXT P
2050 IF B=1 THEN B=0:G=IG-1:IG=0:GOTO 1210
2060 REM If there is no matching label print an error message
2070 ?:?:?"* Missing label at line";G
2080 GOTO 250
2090 REM Find if the identifier is a constant or a variable
2100 WE=0:D$=LEFT$(LA$(G),1)
2110 IF D$="+" OR D$="-" THEN 2130
2120 FOR L=1 TO LEN(LA$(G)):WE=WE+ASC(MID$(LA$(G),L,1)):NEXT L:RETURN
2130 WE=1:A(WE)=VAL(LA$(G)):RETURN
2140 ON BREAK GOTO 2140:?"* Aborted":GOTO 250
2141 IF UY=0 THEN ?"*External error - ignoring":UY=1 ELSE ?"*Permanent error - restarting":A$=GET$(500):RUN
2142 ON ERROR GOTO 2141
2143 GOTO 250
2150 REM Data input routine
2160 PUT 12:?"Type '*' when you have finished data":VA=1
2170 ?"Press RETURN after each item of data"
2180 INPUT"£",DS$
2190 REM Check it isn't the end of the data
2200 IF DS$="*" THEN 250
2210 DS(YH)=VAL(DS$):YH=YH+1:GOTO 2180
2220 ?:?:?"* Data exhausted at line";G:GOTO 250
2230 REM Change line routine
2240 INPUT"Which line:",AQ:?"LINE";AQ:?TAB(2);ID$(AQ);
     TAB(17);IN$(AQ);TAB(33);LA$(AQ):?PR$(AQ):?:?
2250 ?"Enter new line"
2260 TV=X:X=AQ:ZM=1:GOSUB 550
2270 X=TV:RETURN
2280 END
2290 REM List data routine
2300 IF VA<>1 THEN ?:?"* No data":RETURN
2310 ?:?"X";
2320 FOR L=1 TO YH-1
2330 ? DS(L);:NEXT:?:RETURN
2340 IF VA<>1 THEN LPRINT:LPRINT"* No data":RETURN
2350 LPRINT:LPRINT"X";
2360 FOR L=1 TO YH-1
2370 LPRINT DS(L);:NEXT:LPRINT:RETURN
2380 REM Delete routine
2390 INPUT"From:",S
2400 INPUT"To:",E:E=E+1
2410 N=E-S
2420 FOR L=1 TO X
2430 ID$(S+PS)=ID$(E+PS)
2440 IN$(S+PS)=IN$(E+PS)
2450 LA$(S+PS)=LA$(E+PS)
2460 PR$(S+PS)=PR$(E+PS)
2470 PS=PS+1
2480 NEXT
2490 X=X-N
2500 PS=0:RETURN
2510 ?"* That file already exists":RETURN
2520 REM Extra line routine
2530 INPUT"At:",A
2540 FOR L=X TO A STEP -1
2550 ID$(L+1)=ID$(L)
2560 IN$(L+1)=IN$(L)
2570 LA$(L+1)=LA$(L)
2580 PR$(L+1)=PR$(L)
2590 NEXT
2600 ?"Enter extra line"
2610 ZM=1
2620 TV=X:X=A:GOSUB 550
2630 X=TV:X=X+1:RETURN
2640 REM Disk directory
2650 RESET
2660 DIR"*.CES"
2670 RETURN
2680 REM Help routine
2690 PUT 12
2700 ?"Command";TAB(12);"Purpose"
2710 ? LEFT$(UL$,7);TAB(12);LEFT$(UL$,7)
2720 ?"'ESC' key";TAB(12);"To delete whole line"
2730 ?"LIST";TAB(12);"To list program on screen"
2740 ?"LLIST";TAB(12);"To list program on printer"
2750 ?"LISTDATA";TAB(12);"To list data on screen"
2760 ?"LLISTDATA";TAB(12);"To list data on printer"
2770 ?"NEWDATA";TAB(12);"To input a new set of data"
2780 ?"X or DATA";TAB(12);"Enter data"
2790 ?"RUN";TAB(12);"Executes your program"
2800 ?"LRUN";TAB(12);"Executes program on printer"
2810 ?"NEW";TAB(12);"Deletes the existing program"
2820 ?"DELETE";TAB(12);"Delete program line"
2830 ?"EXTRA";TAB(12);"Insert an extra program line"
2840 ?"CHANGE";TAB(12);"To correct a program line"
2850 ?"LISTN";TAB(12);"Listing with line numbers"
2860 ?"LLISTN";TAB(12);"LISTN on the printer"
2870 ?"DIR";TAB(12);"Output disk directory"
2880 ?"LOADPROG";TAB(12);"Input a program from disk"
2890 ?"SAVE";TAB(12);"Record a program onto disk"
2900 ?"ERASE";TAB(12);"To erase a program from disk"
2910 RETURN
2920 REM Select printer option
2930 PUT 12
2940 INPUT"Enter printer type:",PT
2950 INPUT"Enter printer baud rate:",PB
2960 PRINTER PT,PB
2970 RETURN
```

(continued from previous page)
sor being moved automatically to the next position. When you come to the end of a line the cursor will be moved to the beginning of the next or you may move to the beginning of the next line at any time by pressing Line Feed. Pressing Return will return you to the editing mode.

The P command enables a pixel character to be intput by its pattern instead of its ASCII code. After pressing P you will be asked if the character is to be grey or white; answer G or W. Now you will be shown a representation of a pixel character:

1 2
3 4
5 6

Press the keys of the cells that you want lit. For example, the cell at position 3 is lit by pressing 3. When you have finished press 0.

Cesil interpreter

THE PROGRAM by Chris Thompson of Walsingham School, Orpington, Kent, interprets the learning programming language Cesil. The program was written for a Research Machine 380-Z with dual disc drives, but can be simply changed to work with a 480-Z with cassette.

Walsingham school uses the program in 48K RAM but it should just fit in a 32K machine. Research Machines has alredy produced a machine-code version of Cesil but it lacks the advantage of being able to record or load the finished program.

Cesil interpreter.

```
10 REM ******************************
20 REM *                            *
30 REM *          "Cesil"           *
40 REM *  Written by C.A.Thompson   *
50 REM * Written for RML Disk-basic *
60 REM *    (C) Copyright 1982      *
70 REM *                            *
80 REM ******************************
90 REM
100 REM
110 REM Clear string space
120 CLEAR 1000
130 REM Abort routine
140 ON BREAK GOTO 2140
141 ON ERROR GOTO 2141
150 REM Dimension arrays
160 DIM ID$(100),IN$(100),LA$(100),PR$(100),A(540),DS(100)
170 REM Set data variable & Underlining
180 YH=1:FOR L=1 TO 17:UL$=UL$+CHR$(131):NEXT
190 REM Clear screen & set non flashing cursor
200 PUT 31,23,17
210 REM Set up heading
220 LR=0:?:? TAB(9);"Cesil Interpreter"
230 ? TAB(9);UL$
240 REM Print out prompt
250 ?:?"Ready"
260 LR=0:GOTO 540
270 ?:IF C$="" THEN 250
280 REM Check that command is not in lower case
290 IF ASC(C$)>90 THEN ?"* Command in lower case":GOTO 250
300 REM Interpret command
310 IF C$="SELECT" THEN GOSUB 2930:GOTO 250
320 IF C$="DIR" THEN GOSUB 2650:GOTO 250
330 IF C$="DELETE" THEN GOSUB 2390:GOTO 250
340 IF C$="%" OR C$="DATA" THEN 2160
350 IF C$="NEWDATA" THEN YH=1:GOTO 2160
360 IF C$="LISTDATA" THEN GOSUB 2300:GOTO 250
370 IF C$="LLISTDATA" THEN GOSUB 2340:GOTO 250
380 IF C$="LRUN" AND X<>0 THEN LR=1:GOTO 960 ELSE IF C$="LRUN" AND X=0
    THEN ?"* No program resident":GOTO 250
390 IF C$="CHANGE" THEN GOSUB 2240:GOTO 250
400 IF C$="EXTRA" THEN GOSUB 2530:GOTO 250
410 IF C$="NEW" THEN RUN
420 IF C$="LOADPROG" THEN GOSUB 1520:GOTO 250
430 IF C$="SAVE" THEN GOSUB 1260:GOTO 250
440 IF C$="ERASE" THEN GOSUB 1750:GOSUB 250
450 IF C$="LIST" THEN GOSUB 1900:GOTO 250
460 IF C$="LISTN" THEN LI=1:GOSUB 1900:GOTO 250
470 IF C$="LLISTN" THEN LI=1:LR=1:GOSUB 1900:GOTO 250
480 IF C$="LLIST" THEN LR=1:GOSUB 1900:GOTO 250
490 IF C$="HELP" THEN GOSUB 2690:GOTO 250
500 IF C$="RUN" AND X<>0 THEN 960 ELSE IF C$="RUN" AND X=0 THEN ?"*
    No program":GOTO 250
510 REM Print out error message if not understood
520 ?:?"* Syntax error in command"
530 GOTO 250
540 X=X+1
550 REM Program input routine
560 ID$(X)="":IN$(X)="":LA$(X)="":PR$(X)=""
570 ?">";
580 REM Enter Label/Command
590 A=GET()
600 IF A=13 AND LEFT$(ID$(X),1)<>"(" THEN C$=ID$(X):X=X-1:GOTO 270
610 IF A=40 THEN ZN=1
620 IF A=127 AND LEN(ID$(X))>0 THEN ID$(X)=LEFT$(ID$(X),LEN(ID$(X))-1):?
    CHR$(127);:GOTO 590 ELSE IF A=127 THEN 590
630 IF A=32 AND ZN<>1 THEN 680
640 IF A=27 AND ZN<>1 THEN ?:GOTO 560 ELSE IF A=27 AND ZN=1 THEN 590
650 IF A=13 AND ZN<>1 THEN X=X-1:GOTO 250 ELSE IF A=13 AND ZN=1 THEN 910
660 ID$(X)=ID$(X)+CHR$(A):? CHR$(A);:GOTO 590
670 REM Enter the Instruction
680 ? TAB(17);
690 A=GET()
700 IF(A<65 OR A>90)AND A<>27 AND A<>32 AND A<>127 AND A<>13 THEN ?:
    ?"* Instuction error":GOTO 560
710 IF A=127 AND LEN(IN$(X))>0 THEN IN$(X)=LEFT$(IN$(X),
    LEN(IN$(X))-1):? CHR$(127);:GOTO 690 ELSE IF A=127 THEN 690
720 IF A=32 THEN 770
730 IF A=27 THEN ?:GOTO 560
740 IF A=13 THEN 910
750 IN$(X)=IN$(X)+CHR$(A):? CHR$(A);:GOTO 690
760 REM Enter the Identifier
770 ? TAB(33);
780 A=GET()
790 IF A=127 AND LEN(LA$(X))>0 THEN LA$(X)=LEFT$(LA$(X),LEN(LA$(X))-1):? CHR$(127);:GOTO 780
    ELSE IF A=127 THEN 780
800 IF A=32 THEN ?:GOTO 860
810 IF A=27 THEN ?:GOTO 560
820 IF A=13 THEN 910
830 LA$(X)=LA$(X)+CHR$(A):? CHR$(A);:GOTO 780
840 ?
850 REM Enter the Print
860 A=GET()
870 IF A=127 AND LEN(PR$(X))>0 THEN PR$(X)=LEFT$(PR$(X),LEN(PR$(X))-1):? CHR$(127);:GOTO 860
    ELSE IF A=127 THEN 860
880 IF A=27 THEN ?:GOTO 560
890 IF A=13 THEN 910
900 PR$(X)=PR$(X)+CHR$(A):? CHR$(A);:GOTO 860
910 IF ZN=1 THEN ZN=0:ZN=0:RETURN
920 ZN=0
930 X=X+1:?:GOTO 560
940 GOTO 250
950 REM Interpret the program
960 ?"* Program running":?:?:?:CA=0:H1=0:FOR G=1 TO X
970 IF LEFT$(ID$(G),1)="(" THEN 1210
980 IF IN$(G)="ADD" THEN GOSUB 2100:CA=CA+A(WE):GOTO 1210
990 IF IN$(G)="SUBTRACT" THEN GOSUB 2100:CA=CA-A(WE):GOTO 1210
1000 IF IN$(G)="MULTIPLY" THEN GOSUB 2100:CA=CA*A(WE):GOTO 1210
1010 IF IN$(G)="DIVIDE" THEN GOSUB 2100 ELSE 1040
1020 IF A(WE)=0 THEN ?"* Can't divide by zero at line";G:GOTO 1210
1030 CA=CA/A(WE):GOTO 1210
1040 IF IN$(G)="LOAD" THEN GOSUB 2100:CA=A(WE):GOTO 1210
1050 IF IN$(G)="STORE" THEN GOSUB 2100:A(WE)=CA:GOTO 1210
1060 IF IN$(G)="LINE" AND LR=1 THEN LPRINT:GOTO 1210 ELSE IF IN$(G)="LINE"
     THEN ?:GOTO 1210
1070 IF(IN$(G)="PRINT" AND LEFT$(PR$(G),1)<>CHR$(34)) OR (IN$(G)="PRINT" AND
     RIGHT$(PR$(G),1)<>CHR$(34)) THEN 1200
1080 IF IN$(G)="PRINT" AND LR=1 THEN LPRINT LEFT$(RIGHT$(PR$(G),LEN(PR$(G))-1),
     LEN(PR$(G))-2);:GOTO 1210
1090 IF IN$(G)="PRINT" THEN ? LEFT$(RIGHT$(PR$(G),LEN(PR$(G))-1),LEN(PR$(G))-2);
     :GOTO 1210
1100 IF IN$(G)="OUT" AND LR=1 THEN LPRINT INT(CA);:GOTO 1210 ELSE IF IN$(G)=
     "OUT" THEN ? INT(CA);:GOTO 1210
1110 IF IN$(G)="IN" THEN 1120 ELSE 1150
1120 H1=H1+1
1130 IF H1>YH-1 THEN 2220
1140 CA=DS(H1):GOTO 1210
1150 IF IN$(G)="HALT" THEN 1220
1160 IF IN$(G)="JIZERO" AND CA=0 THEN 2000 ELSE IF IN$(G)="JIZERO" AND CA<>0 THEN 1210
1170 IF IN$(G)="JINEG" AND CA<0 THEN 2000 ELSE IF IN$(G)="JINEG" AND CA>=0 THEN 1210
1180 IF IN$(G)="JUMP" THEN 2000
1190 REM Error message if intruction not understood
1200 ?:?:?"* Syntax error at line";G:GOTO 250
1210 NEXT
1220 IF LR=1 THEN LPRINT
1230 REM Execution finished
1240 ?:?:?:?"* Finished":H1=0:GOTO 250
1250 REM Save program routine
1260 ?:INPUT"Filename:",F$
1270 RESET
1280 REM Error message if filename too large
1290 IF LEN(F$)>8 THEN ?"* Filename too large":GOTO 250
```

Table 1. Graphics Editor commands.

Esc	return to menu
!	clear screen
I	move cursor up
J	move cursor left
K	move cursor right
M	move cursor down
T	move cursor to top of screen
B	move cursor to bottom of screen
L	move cursor to left edge of screen
R	move cursor to right edge of screen
C	input ASCII code to be plotted at cursor
N	character of next key pressed to be plotted
P	pixel character — input by pattern
F	fill rectangle with character; lines are thin rectangles
H	help find ASCII code of characters
X	plot text, automatic wrap-round; press Return to finish or Line Feed to move cursor to the beginning of next line; cursor is a @
A	string of above commands automatically operated; Ctrl-Z to abort

(listings continued from page 144)

10210-10230, new screen, initialise variables and branch to Editor.

10300-10440, edit old screen, Get old screen from file, display and branch to Editor.

10500-10650, Save screen, create new file and Save screen, Return to main menu.

10700, continue, redisplay screen and branch to editor.

The commands for using the routine are shown in table 1. To fill a rectangle with a character, line the cursor up with one of the corners of the rectangle and press F. A message will be displayed reminding you that the Fill routine is on.

Now move the cursor to the diagonally opposite corner and press F again. Two cursors will now be displayed, one at each of the corners that you have indicated. Input the ASCII code of the character that you wish to use — or H for help to find it — and the rectangle will be filled with it.

To set a macro command press A, then press one of the nine digits 1 to 9 and answer N to the Operate? prompt. If the message is No Auto you may answer Y to create a new one; if there already is one it will be displayed and you can choose to leave it or to change it.

If you answer N to the Change It? prompt you will be given a chance to choose another auto or to return to Editing mode. If you answer N to the Another Auto? prompt you will be asked if you want to operate with the existing one.

To create a macro simply type in a string of commands, except A, and they will be operated automatically when you choose to operate that macro. One macro may call another; to do this use the number of that other macro in the string. A macro may not call itself or another macro that in turn calls it.

The X commands enables you to type passages of text on the screen with the cur-

(continued on next page)

(listing continued from page 144)

```
6000 PLOTX,Y,"+":PUT12:?"Grey or white";
6020 GW=GET():GW=GW+32*(GW>90)
6025 IFGW<>71ANDGW<>87GOTO6020
6030 IFGW=71THENPX=128ELSEPX=192
6035 PLOTX,Y,M
6040 PUT12:?"Enter pattern    1 2":?TAB(17);"3 4    - to restart"
6045 ?TAB(17);"5 6    0 to finish."
6050 PLOTX,Y,"+":P=GET(10):PLOTX,Y,M:IFP<48ORP>54ANDP<>45GOTO6050
6060 PX=PX-(P=49)-2*(P=50)-4*(P=51)-8*(P=52)-16*(P=53)-32*(P=54)
6065 IFP=45THENPX=192+64*(GW=71)
6070 PLOTX,Y,PX:M=PX:IFP=48THENRETURNELSE6050

7000 PG=0:GOSUB8000:PUT12:GRAPH1:PLOT36,51,"Press"
7005 PLOT12,48,"< to decrease    > to increase":PLOT30,45,"R to finish"
7010 HP=0
7020 PLOT0,30,128:LINE78,30:PLOT30,30,STR$(HP):PLOT40,30,HP
7025 H=GET()
7030 IFH=60ORH=44THENHP=HP-1:IFHP<0THENHP=255
7035 IFH=62ORH=46THENHP=HP+1:IFHP>255THENHP=0
7036 IFH=82ORH=114THENGOSUB2500:RETURN
7040 GOTO7020

8000 PUT12:?"Saving screen, please wait."
8005 FORI=0TO19:SCREEN$(I)="":FORXX=0TO78STEP2
8020 SCREEN$(I)=SCREEN$(I)+CHR$(POINTS(XX,I*3))
8030 NEXTXX:PLOT0,I*3,128:LINE78,I*3:NEXTI:RETURN

8500 PUT12:?"Clear screen, are you sure <Y/N>(RTN)";
8510 INPUTCL$:IFCL$="Y"THENGRAPH1:RETURNELSERETURN

9000 B=ERR
9010 IFB=27THEN?:?"Read error - possible hardware fault.":RETURN
9020 IFB=34THEN?:?"Invalid device name, try again.":RETURN
9030 IFB=35THEN?:?"Invalid file name, try again.":RETURN
9040 IFB=36THEN?:?"Write error - possible hardware fault.":RETURN
9050 IFB=38THEN?:?"Sorry can't find ";FL$:RETURN
9060 IFB=40THEN?:?"Sorry the disc is full, replace it and try again.":RETU
RN
9070 IFB=20THEN?:?"This file should have been saved as":?"codes.":RETURN
9080 IFB=14THEN?:?"You specified the wrong type of file":?"eg. strings ins
tead of codes.":RETURN
9090 ?"ERROR ";B:END

10100 TEXT:PUT12:IN$="NESCB":IN=0
10110 ?"The following options are available:":?
10120 ?"      < N >  create a new screen"
10130 ?"      < E >  edit an old screen"
10140 ?"      < S >  save the current screen"
10150 ?"      < C >  continue current screen":?
10152 ?"      < B >  bye.":?:?:?
10155 ?"Which do you want?";
10160 Q=GET():Q=Q+32*(Q>90):Q$=CHR$(Q)
10170 FORI=1TO5:IFQ$=MID$(IN$,I,1)THENIN=I
10175 NEXTI
10190 IFIN=0GOTO10160ELSE?
10200 ONINGOTO10210,10300,10500,10600,10800

10210 PUT12:GRAPH1:FL$=""
10220 X=0:Y=0:M=128:PLOTX,Y,"+":GOTO1125

10300 PUT12
10310 ?"What is the file called (RTN)"
10315 INPUT"          ";FL$
10320 ONERRORGOTO10390
10330 OPEN#10,FL$:GRAPH1
10335 ?"Is the file strings or ASCII codes?";
10336 Q=GET():Q=Q+32*(Q>90)
10337 IFQ<>65ANDQ<>67ANDQ<>83GOTO10336ELSE?
10338 IFQ<>83GOTO10800
10340 FORI=0TO19:INPUTLINE#10,SCREEN$(I)
10345 PLOT0,I*3,SCREEN$(I):NEXTI:CLOSE#10
10360 X=0:Y=0:M=POINTS(X,Y):PLOTX,Y,"+":GOTO1125
10390 GOSUB9000:GOTO10310
10400 FORI=0TO19:SCREEN$(I)="":FORJ=0TO78STEP2
10420 INPUT#10,Z:PLOTJ,I*3,Z:SCREEN$(I)=SCREEN$(I)+CHR$(Z)
10440 NEXTJ:NEXTI:CLOSE#10:GOTO10360

10500 PUT12:GOSUB2500
10510 ?"What shall the file be called (RTN)"
10515 INPUT"          ";FL$:IFFL$=""GOTO10515
10520 ?:?"Do you want the screen saved as strings"
10521 ?"or ASCII codes. Nb.if you have used an"
10522 ?"End of File code you must use codes.":?
10523 ?"Strings or Codes?";
10525 Q=GET():Q=Q+32*(Q>90):IFQ<>67ANDQ<>83GOTO10525ELSE?
10526 IFQ=67GOTO10600
10530 ONERRORGOTO10590
10535 RESET:CREATE#10,FL$:QUOTE#10,0
10550 FORI=0TO19:PRINT#10,SCREEN$(I):NEXTI:CLOSE#10:GOTO10100
10590 GOSUB9000:GOTO10510
10600 ONERRORGOTO10490:PUT12:GRAPH1:GOSUB2500:CREATE#10,FL$:QUOTE#10,0
10620 FORYY=0TO57STEP3:FORXX=0TO78STEP2
10640 Z=POINTS(XX,YY):PRINT#10,Z
10650 NEXTXX:NEXTYY:CLOSE#10:GOTO10100

10700 GRAPH1:GOSUB2500:GOTO1125

10800 TEXT:PUT12:END
```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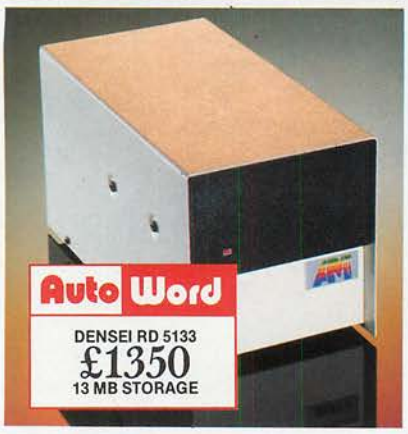

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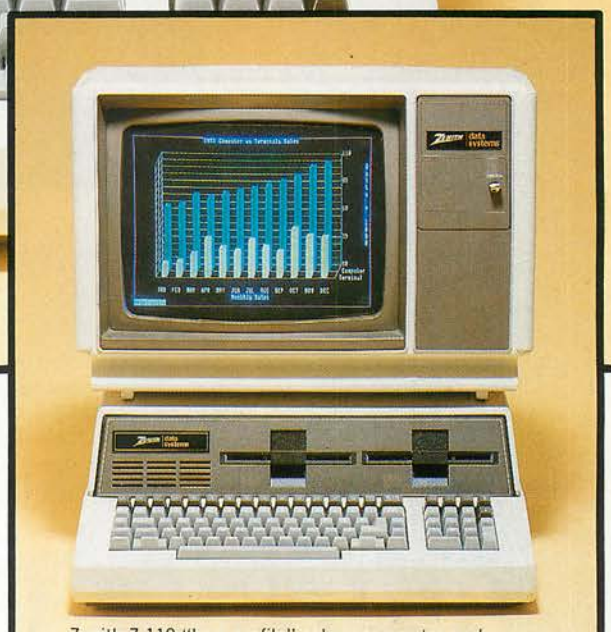

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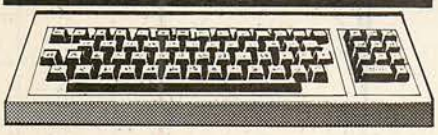


Graphics editor

HERE IS a graphics utility by D C Hamilton of Belfast that will enable the user to create, edit and save low-resolution graphics screens on the 380-Z. Screens can be saved in two different formats, either as a list of 800 ASCII codes or as a list of 20 strings, and then recalled by a Basic program using one of the recall routines.

Obviously, saving the screen as strings will mean a smaller file and a faster recall time, and this will be the most popular format. But if you have used codes below 32 you may have problems saving the screen as strings: for example, if you have used code 28 and saved the file as strings, when you try to recall the screen this will be interpreted as an End of File marker and you will lose part of the screen. In these cases the screen must be saved as ASCII codes.

The main features of the program are:

1000-1160, main editor loop, get command and operate. Print data on screen — X and Y co-ordinates of cursor and ASCII code of character under cursor.
1500-1540, X : test routine.
2000-2240, A : macro command routine.
2500, recall screen, for example, after Help routine.
3000-3100, F : fill command routine.
4000, N: plot next key routine.
5000-5040, C : input code routine.
6000-6070, P : pixel character routine.
7000-7040, H : Help routine.
8000-8030, Save screen routine; for example, before Help routine.
8500-8510, ! : Clear Screen routine.
9000-9090, error-trapping routine.
10100-10200, main menu.

(continued on page 149)

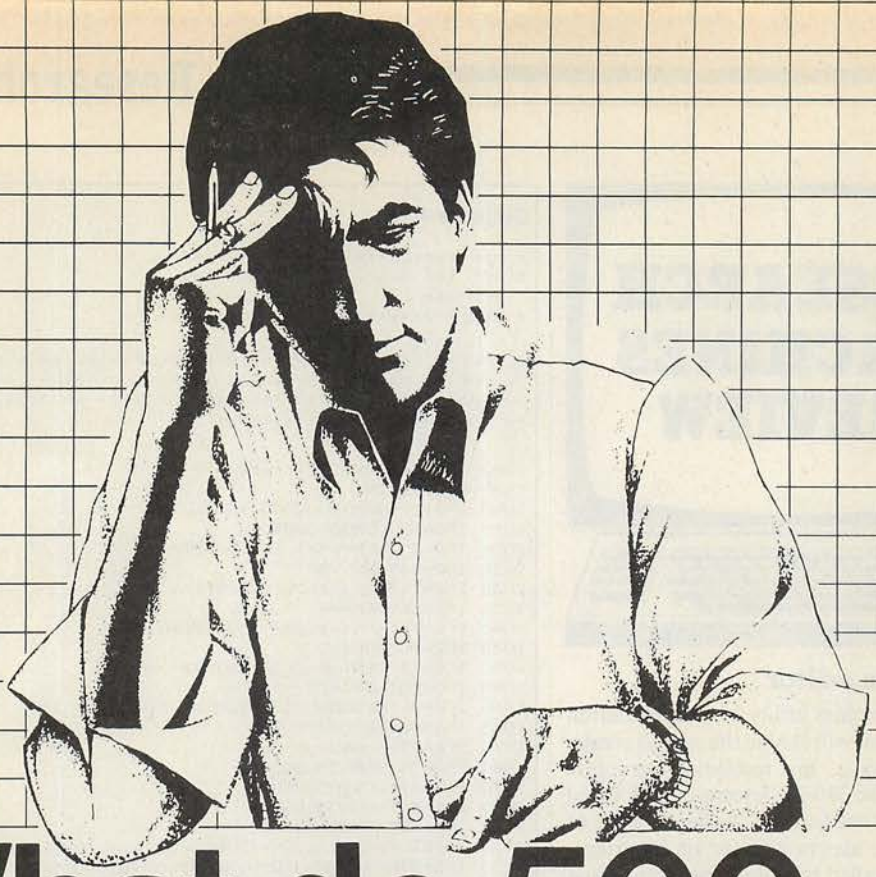
Graphics editor — recall routines.

```
          ASCII Codes
          -----------
1000 OPEN#10,"FILENAME.TYP"
1010 FOR YY=0 TO 57 STEP 3
1020 FOR XX=0 TO 78 STEP 2
1030 INPUT#10,CC : PLOT XX,YY,CC
1040 NEXT XX
1050 NEXT YY
1060 CLOSE#10

            Strings
            -------
1000 OPEN#10,"FILENAME.TYP"
1010 FOR YY=0 TO 57 STEP 3
1020 INPUTLINE#10,CC$ : PLOT 0,YY,CC$
1030 NEXT YY
1040 CLOSE#10
```

Graphics editor

```
1 REM ************************
2 REM *** GRAPHICS UTILITY ***
3 REM ***  (c) C.Hamilton  ***
4 REM ************************

10 PUT17:PUT12:CLEAR5000:DIM SCREEN$(19),MC$(9),MN(8),PG(8),PL(8)
20 FORI=1TO9:MC$(I)="*No auto number'+STR$(I)+" in memory yet.":NEXTI
30 GRAPH1:PLOT24,33,"GRAPHICS UTILITY":PLOT26,30,"(c) C.Hamilton"
40 FORT=0TO2000:NEXTT:GOTO10100

1000 ONBREAK:Q=GET(1):Q=Q+32*(Q>90)
1005 PLOTX,Y,M
1010 IFQ=27THENGOSUB8000:GOTO10100
1015 IFQ=33THENGOSUB8500
1020 IFQ=73THENY=Y+3:IFY>57THENY=57
1025 IFQ=84THENY=57
1030 IFQ=74THENX=X-2:IFX<0THENX=0
1035 IFQ=66THENY=0
1040 IFQ=75THENX=X+2:IFX>78THENX=78
1045 IFQ=76THENX=0
1050 IFQ=77THENY=Y-3:IFY<0THENY=0
1055 IFQ=82THENX=78
1060 IFQ=70THENGOSUB3000:GOTO1130
1065 IFQ=88THENGOSUB1500
1070 IFQ=72THENGOSUB7000
1080 IFQ=78THENGOSUB4000
1090 IFQ=67THENGOSUB5000
1100 IFQ=80THENGOSUB6000
1105 IFQ=65THENGOSUB2000
1110 M=POINTS(X,Y):IFM=43THENPLOTX,Y,128ELSEPLOTX,Y,"+"
1120 IFQ=0THENFORP=0TO50:NEXTP:GOTO1000
1125 PUT12
1130 ?" X"," Y","CODE":?X,Y,M
1150 IFFF=1THEN?"FILL on, press F to finish."
1155 IFPF>0GOTO2110
1160 GOTO1000

1500 PLOTX,Y,"@":C=GET(10)
1505 IFC=0THENPLOTX,Y,M:FORT=0TO50:NEXTT:GOTO1500
1510 IFC=13THENPLOTX,Y,M:RETURN
1520 IFC=10THENPLOTX,Y,M:X=0:Y=Y+3*(Y>0):GOTO1540
1525 IFC=127THENPLOTX,Y,128:X=X-2:IFX<0THENX=78:Y=Y-3*(Y<78):GOTO1500ELSE1
500
1530 PLOTX,Y,C:X=X+2:IFX>78THENX=0:Y=Y+3*(Y>0)
1540 M=POINTS(X,Y):GOTO1500

2000 PUT12:?"Which auto (1-9,0 to return)?";
2010 MN=GET():IFMN<48ORMN>57GOTO2010ELSE?
2015 IFMN=48THENRETURN
2018 MN=MN-48
2020 PUT12:?MC$(MN):?"Operate?";:GOSUB2200:ONINGOTO2100,2030
2030 PUT12:?MC$(MN):?"Change it?";:GOSUB2200:ONINGOTO2050,2040
2040 PUT12:?"Another auto?";:GOSUB2200:ONINGOTO2000,2020
2050 PUT12:?"Type in auto (RTN).":INPUTMC$(MN):GOTO2030
2100 PF=1:MN(PF)=MN:PG(PF)=0:PL(PF)=LEN(MC$(MN(PF)))
2101 ONBREAKGOTO2150
2105 IFLEFT$(MC$(MN(PF)),1)="*"THENPF=PF-1:IFPF=0GOTO2150
2110 PG(PF)=PG(PF)+1:IFPG(PF)>PL(PF)THENPF=PF-1:IFPF=0GOTO2150ELSE2110
2120 Q=ASC(MID$(MC$(MN(PF)),PG(PF),1)):IFQ<49ORQ>57GOTO1005
2125 IFQ=65ORQ=97GOTO2110
2130 PF=PF+1:IFPF>8THEN?"Too complex.":GOTO2150
2140 PG(PF)=0:MN(PF)=Q-48:PL(PF)=LEN(MC$(MN(PF))):GOTO2110
2150 PF=0:PLOTX,Y,M:RETURN
2200 IN=0
2210 QQ=GET():QQ=QQ+32*(QQ>90)
2220 IFQQ=78THENIN=2:?:RETURN
2230 IFQQ=89THENIN=1:?:RETURN
2240 GOTO2210

2500 FORI=0TO19:PLOT0,I*3,SCREEN$(I):NEXTI:RETURN

3000 IFFF=1GOTO3040
3010 PUT12:?"FILL on, press F to finish.":?:X0=X:Y0=Y:FF=1:RETURN
3040 X1=X:Y1=Y:FF=0:PLOTX,Y,"+":PLOTX0,Y0,"+"
3050 PUT12:INPUT"What code (or H for help)(RTN)";CD$
3055 IFCD$="H"THENGOSUB7000:GOTO3050
3060 CD=VAL(CD$):IF(CD=0ANDCD$<>"0")ORCD>255GOTO3050
3070 IFX0>X1THENTX=X0:X0=X1:X1=TX
3075 IFY0>Y1THENTY=Y0:Y0=Y1:Y1=TY
3076 PLOTX0,Y0,128:PLOTX,Y,M
3080 FORI=X0TOX1STEP2:FORJ=Y0TOY1STEP3
3100 PLOTI,J,CD:NEXTJ:NEXTI:PUT12:M=CD:RETURN
4000 PLOTX,Y,"+":L$=GET$():PLOTX,Y,L$:M=ASC(L$):RETURN

5000 PLOTX,Y,"+"
5005 PUT12:INPUT"What code (or H for help)(RTN)";CD$
5010 IFCD$="H"THENGOSUB7000:GOTO5005
5020 CD=VAL(CD$):IF(CD=0ANDCD$<>"0")ORCD>255GOTO5000
5040 PLOTX,Y,CD:M=CD:RETURN
```

(listings continued on page 149)



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(continued from previous page)
BBC Basic with both style and assembler code. Some bridge clubs have competitions which involve the same hand being played in different rooms at the same time, and the preparation of two deals of hands in their original unsorted order is doubtless a pig of a job which this program would simplify.

Well pleased with myself at having found a use for the program, I happened to run it later to show my wife. We spent the next couple of hours arguing over the way each hand should be bid. But even if you do not play, the code is well worth browsing through for ideas and coding technique.

Bridge-hand generator.

```
  10 REM Card Shuffle in Machine Code
  20 REM Shuffle consists of 100 random
  30 REM Cuts and 100 riffles, which
  40 REM interleaves the deck. Before
  50 REM leaving the Machine Code
  60 REM Subroutine, the four hands are
  70 REM sorted into descending order.
  80 REM With 100 cuts the operation
  90 REM takes 180 ms.
 100 REM The program is relocatable.
 110 REM
 120 REM J.M. Leach, July 1982
 130 REM
 140 DIM DECK 52:DIM WORK 52
 150 CUT=&70:REM Random Cut position
 160 NSHUFF=&71:REM Number of cuts
 170 CUTFLG=&72:REM Flag for INC or DEC
 180 HANDLO=&73:REM Start of Hand sort
 190 HANDHI=&74:REM End of Hand sort
 200 SFLAG =&75:REM Sort Flag for swaps
 210FOR I%=0 TO 3 STEP 3
 220 P%=&0D00:REM Uses Disk buffer
 230[ OPT 0 \ Use OPT I% for List
 240.shuffle LDX CUT  \ Get random seed
 250         LDY £1   \ 1st half of Cut
 260.move1   JSR shift\ Do 1st half cut
 270         CPX £53  \ Finished ?
 280         BNE move1\ No - continue
 290         LDX £1   \ 2nd half of cut
 300.move2   JSR shift\ Do 2nd half
 310         CPX CUT  \ Finished yet ?
 320         BNE move2\ No - continue
 330         LDX £27  \ Now interleave
 340         LDY £1   \ by moving back
 350.move3   JSR riffle\WORK byte array
 360         CPX £53  \ to DECK array
 370         BNE move3
 380         LDX £1
 390         LDY £2
 400.move4   JSR riffle
 410         CPX £27
 420         BNE move4 \ Complete riffle
 430         DEC NSHUFF\ Shuffle over ?
 440         BNE next  \ No - Alter CUT

 450         JSR save  \ Save unsorted
 460         LDA £1    \ Sort Hand 1
 470         STA HANDLO\ DECK position
 480         LDA £13   \ from 1 to 13
 490         STA HANDHI
 500         JSR sort  \ Sort the hand
 510         LDA £14   \ Hand 2
 520         STA HANDLO
 530         LDA £26
 540         STA HANDHI
 550         JSR sort
 560         LDA £27   \ Hand 3
 570         STA HANDLO
 580         LDA £39
 590         STA HANDHI
 600         JSR sort
 610         LDA £40   \ Hand 4
 620         STA HANDLO
 630         LDA £52
 640         STA HANDHI
 650         JSR sort
 660         RTS       \ Sorting ended
 670.next    LDA CUTFLG \ INC or DEC ?
 680         BEQ decut  \ DEC if zero
 690         INC CUT    \ INC and then
 700         LDA CUT    \ compare with
 710         CMP £43    \ preset Max.
 720         BMI shuffle\ for CUT
 730         LDA £0     \ At Max., so
 740         STA CUTFLG \ set flag for
 750         BEQ shuffle\ next time !
 760.decut   DEC CUT    \ DEC and test
 770         LDA CUT    \ against pre-
 780         CMP £10    \ set Min.
 790         BPL shuffle
 800         LDA £1     \ At Min., so
 810         STA CUTFLG \ set flag and
 820         BNE shuffle\ continue
 830.shift   LDA DECK,X \ Move 1 Byte
 840         STA WORK,Y \ from DECK to
 850         INX        \ WORK and INC
 860         INY        \ the X and Y
 870         RTS        \ registers
 880.riffle  LDA WORK,X \ Move 1 Byte
 890         STA DECK,Y \ from WORK to
 900         INX        \ DECK and INC X
 910         INY        \ once and Y
 920         INY        \ twice
 930         RTS
 940.sort    LDA £0     \ Bubble Sort
 950         STA SFLAG  \ Flag at zero
 960         LDX HANDLO \ Get position
 970.sort1   LDA DECK,X \ Get 1st byte
 980         INX
 990         CMP DECK,X \ Test v. 2nd
1000         BMI sort2  \ Late > early
1010         TAY        \ Swap; save 1st

1020         LDA DECK,X \ Get 2nd byte
1030         DEX        \ Save 2nd in
1040         STA DECK,X \ place of 1st
1050         INX        \ 2nd position
1060         TYA        \ Restore 1st
1070         STA DECK,X \ Place at 2nd
1080         STA SFLAG  \ Flag <> 0 !
1090.sort2   CPX HANDHI \ End of test ?
1100         BMI sort1  \ No - continue
1110.check   LDA SFLAG  \ Any swaps ?
1120         BNE reset  \ Yes - Re-do
1130         RTS        \ No - sort ends
1140.reset   DEC HANDHI \ Reduce range
1150         BNE sort   \ for next time
1160         RTS
1170 .save   LDX £52
1180 .sloop  LDA DECK,X
1190         STA WORK,X
1200         DEX
1210         BNE sloop
1220         RTS
1230]
1240 NEXT I%:REM 2nd Assembler pass
1250 MODE 7: SEED%=RND(-TIME):NHAND%=0
1260 PROCBIG(5,4,131,"Card Dealing Prog
ram")
1270 PROCBIG(5,8,133,"Written by J.M. L
each")
1280 PROCBIG(5,12,130,"Deals a hand and
sorts it")
1290 PROCBIG(5,16,134,"Press"+CHR$136+C
HR$131+"SPACE BAR"+CHR$137+CHR$134+"to c
ontinue")
1300 PROCBIG(5,20,130,"and to show a ne
w hand")
1310 X=GET
1320 REM
1330 REM Set up card deck as bytes
1340 REM Bits 0 1    2 3    4 5 6 7
1350 REM        x x    Suit   Value
1360 REM
1370 I%=0:FOR S%=0 TO 3:SUIT%=S%*&10
1380FOR V%=1 TO 13:CARD%=SUIT%+V%
1390I%=I%+1:DECK?I%=CARD%:REM 'POKE' DE
CK
1400NEXT V%:NEXT S%
1410 REM Set up Suits with colours
1420suit$=CHR$132+"S"+CHR$129+"H"+CHR$1
29+"D"+CHR$132+"C"
1430 REM
1440 REM Value from bits 4,7: A=1, 2=13
1450 REM
1460val$=" A K Q J10 9 8 7 6 5 4 3 2"
1470 DIM XPOS%(3):DIM YPOS%(3):DIM PLAC
E$(3)
1480 REM Set up places with colours
1490 PLACE$(0)=CHR$130+"North":PLACE$(1
)=CHR$131+"East":PLACE$(2)=CHR$133+"Sout
h":PLACE$(3)=CHR$134+"West"
1500 REM
1510 REM Deal out a hand and display it
1520 REM
1530 REM First set CUT seed position
1540 REM and number of shuffles
1550 REM
1560 ?CUT=RND(25)+15:?NSHUFF=100
1570 CALL shuffle:REM Machine Code call

1580 CLS
1590 REM Create a white background
1600 FOR I%=0 TO 24: PRINT CHR$157;CHR$
158;CHR$151;:IF I%<24 THEN PRINT ELSE VD
U30
1610 NEXT I%
1620 REM Initialise the cursor position
s
1630 REM and label places
1640 FOR I%=0 TO 3:XPOS%(I%)=10:YPOS%(I
%)=I%*2
1650 PRINT TAB(1,2*I%);PLACE$(I%);
1660 NEXT I%
1670 REM Display unsorted hand from WOR
K
1680 FOR I%=1 TO 13:FOR J%=0 TO 3
1690 PRINT TAB(XPOS%(J%),YPOS%(J%));:PR
OCDECODE(I%+13*J%,1,1):XPOS%(J%)=POS:IF
POS>35 THEN XPOS%(J%)=10:YPOS%(J%)=YPOS%
(J%)+1
1700 REM Generate note from card value
1710 note%=4*(V%+13*S%):PROCSOUND(note%
,1)
1720 X=INKEY(11):REM Delay for sound
1730 REM Show Hand No. flashing
1740 NEXT J%:NEXT I%:VDU30
1750 NHAND%=NHAND%+1
1760 H$="Hand "+STR$(NHAND%)
1770 PRINT TAB(25,8);CHR$136;CHR$132;H$
;
1780 REM Show places for sorted hands
1790 FOR J%=0 TO 3:YPOS%(J%)=9+4*J%:XPO
S%(J%)=11:PRINT TAB(1,YPOS%(J%));PLACE$(
J%);
1800 REM Show suits for sorted hands
1810 FOR K%=0 TO 3:PRINT TAB(7,YPOS%(J%
)+K%);MID$(suit$,2*K%+1,2);LEFT$(PLACE$(
J%),1);:NEXT K%:NEXT J%
1820 REM Show sorted cards from DECK
1830 FOR J%=0 TO 3:Y%=YPOS%(J%)-1:X%=11
:SS%=-1:FOR I%=1 TO 13
1840PROCDECODE(I%+13*J%,2,0):IF S%<>SS%
THEN X%=11:Y%=Y%+S%-SS%:SS%=S%
1850 REM Strip out Card value
1860 L%=LEN(card$):card$=LEFT$(card$,L%
-1):card$=RIGHT$(card$,L%-2)
1870 PRINT TAB(X%,Y%);card$+"  ";:X%=POS

1880 PROCSOUND(4*(V%+13*S%),1):X=INKEY(
3)
1890 NEXT I%:NEXT J%
1900 X=GET:GOTO 1560
1910 REM Convert DECK or WORK to Card
1920 DEF PROCDECODE(N%,PACK%,PR%)
1930 IF PACK%=1 THEN K%=WORK?N% ELSE K%
=DECK?N%:REM 'PEEK' for coded Card
1940 S%=(K% AND &F0)/&10:V%=K% AND &0F:
REM Get Suit and Value
1950 card$=CHR$132:IF S%=1 OR S%=2 THEN
card$=CHR$129:REM Blue or Red
1960 Q%=(V%=5):REM Test for '10'
1970 card$=card$+MID$(val$,2*(V%-1)+2+Q
%,1-Q%)+MID$(suit$,2*S%+2,1):IF PR%>0 TH
EN PRINT card$;
1980 ENDPROC
1990 Print Double sized text
2000 DEF PROCBIG(XCOL%,YROW%,HUE%,A$)
2010 HUE%=HUE% MOD 8 + 128
2020 PRINT TAB(XCOL%,YROW%);CHR$141;CHR
$HUE%;A$;:PRINT TAB(XCOL%,YROW%+1);CHR$1
41;CHR$HUE%;A$;:ENDPROC
2030 DEF PROCSOUND(NN%,del%)
2040 LOCAL NS%:NS%=240-NN%
2050 SOUND1,-10,NS%,del%:SOUND2,-10,NS%
+16,del%:SOUND3,-10,NS%+28,del%
2060 ENDPROC
```

(continued from page 136)

lar machine — like the NCR-315, with never an integrated circuit to its name, sitting between banks of Cram units playing *A walk in the Black Forest* through the output transistor of its line printer.

One program from the days of the mainframe, Tracks, is an old favourite of mine, and when I saw Tangle by Mark Callaway of Alnwick, Northumberland, I first thought that this was an implementation of it.

Tracks was played on a 22 by 39 board, while Tangle is high-resolution. That difference makes a completely different game of it, and demonstrates the change in the handling of information representations which high resolution has brought in. The world is still digital, but it is starting to look and feel analogue again.

Space Invaders

On receiving a listing from P McLean of London I found myself in a curious position. The author has assumed that anyone interested in keying up his Space Invaders program knows the original game, and here I have been remiss; I have played neither the original nor any imitation or offshoot.

Notwithstanding, I keyed it in and the results of my keying I present. The prime difference between the master copy and what you see here is my addition of line 411. You may omit it if you wish, but I assume that the object of the game is to overlap the beasties and, while in that state, to "G" them off the screen. I found it easier to merely approach them to within my arbitrary three-space units.

Putting it another way, I failed miserably to raise my score above zero without some such fudge. Devotees who are laughing themselves silly at this point can omit the line, and good luck to them.

Bridge-hand generator

I thank John Leach of Great Mongeham, Kent for the tape of this card shuffler and dealer — a very kind thought, that tape — which permits me to present an example of

(continued on next page)

Tangle.

```
   10REM **** TANGLE ****
   20REM by Mark Callaway
   30REM        1983
   40 rscore=0:lscore=0
   50MODE7
   60PRINTCHR$141;"Welcome to TANGLE"
   70PRINTCHR$141;"Welcome to TANGLE"
   80PRINT"The idea of the game is to st
eer your  player and to avoid hitting
any lines."
   90INPUT"Name of left hand Player ",lp
layer$
   100INPUT"Name of right hand Player ",r
player$
   110PRINT'lplayer$;" you use these keys
: W(up) D(right) A(left) X(down)"
   120PRINT'rplayer$;" you use these keys
: I(up) L(right) J(left) ,(down)"
   130INPUT'"Size of board (100 to 500) "
,size
   140 MODE4:MOVE640-size,512-size:DRAW64
0+size,512-size:DRAW640+size,512+size
   150DRAW640-size,512+size:DRAW640-size,
512-size
   160lxp=640-(size/2):lyp=512-(size/2):l
xd=0:lyd=4
   170rxp=640+(size/2):ryp=512+(size/2):r
xd=0:ryd=-4
   180a$=INKEY$(0):IFa$=""THEN270
   190 IFa$="W"THENlxd=0:lyd=4:GOTO270
   200IFa$="I"THENrxd=0:ryd=4:GOTO270
   210IFa$="L"THENrxd=4:ryd=0:GOTO270
   220IFa$="D"THENlxd=4:lyd=0:GOTO270
   230IFa$="A"THENlxd=-4:lyd=0:GOTO270
   240IFa$="J"THENrxd=-4:ryd=0:GOTO270
   250IFa$=","THENrxd=0:ryd=-4:GOTO270
   260IFa$="X"THENlxd=0:lyd=-4:GOTO270
   270lxp=lxp+lxd:lyp=lyp+lyd
   280 IF POINT(lxp,lyp)=1THENPRINTlplaye
r$;" has crashed.":rscore=rscore+1:GOTO3
50
   290rxp=rxp+rxd:ryp=ryp+ryd
   300 IF POINT(rxp,ryp)=1THENPRINTrplaye
r$;" has crashed.":lscore=lscore+1:GOTO3
50
   310PLOT69,lxp,lyp
   320PLOT69,rxp,ryp
   330SOUND1,-10,(lxp+rxp)/10,1:SOUND2,-1
0,(lyp+ryp)/8,1
   340GOTO180
   350FORX=12TO15:SOUND0,-15,X,10:NEXT
   360PRINTlplayer$;" has ";lscore;" poin
ts"
   370PRINTrplayer$;" has ";rscore;" poin
ts"
   380PRINT"Another game?";
   390a$=GET$:IFa$="n"THEN END ELSE GOTO
140
```

Space Invaders.

```
   1REM.-----------------------------
   2REM.-                           --
   3REM.-        P. MCLEAN          --
   4REM.-                           --
   5REM.-   SPACE INVADERS TYPE     --
   6REM.-          GAME             --
   7REM .                           --
   8REM .-----------------------------
   10INPUT"SKILL LEVEL",TT
   20SC=0:W=TT+1:SCR=1
   30MODE5
   50DIMX%(7),Y%(7)
   60NI=2:ST=3+5*TT
   70PROCinit
   80GCOL4,0:PRINTTAB(10,10);"+"
   90ND=0
   100FORI=1TONI
   110B$=INKEY$(0)
   120IFB$="G"THENPROCfire
   130IFX%(I)=-1THENGOTO150
   140PROCinv(X%(I),Y%(I))
   150SOUND&10,-15,3,1
   160GOSUB170:GOTO250
   170B$=INKEY$(0)
   180XX=X:YY=Y
   190IFB$="W"THENY=Y-1:PROCmove
   200IFB$="A"THENX=X-1:PROCmove
   210IFB$="D"THENX=X+1:PROCmove
   220IFB$="X"THENY=Y+1:PROCmove
   230IFB$="G"THENPROCfire
   240RETURN
   250NEXT
   260GOSUB170
   270IF ND = NI THEN GOTO 1090
   280GCOL0,2:PLOT4,FU,15:PLOT5,FU,45:PLO
T85,FU+ST,45:PLOT4,FU,15:PLOT5,FU+ST,15:
PLOT85,FU+ST,45
   290FU=FU-ST
   300IFFU<300THENGOTO1200
   310COLOUR1:PRINTTAB(6,29);SC:PRINTTAB(
11,29);SCR:PRINTTAB(14,29);W
   320GOTO100
   330DEFPROCmove
   340COLOUR0:PRINTTAB(XX,YY);"+";
   350COLOUR1:PRINTTAB(X,Y);"+";
   360ENDPROC
   370DEFPROCfire
   380COLOUR2:PRINTTAB(X,Y);"X"
   390FORQ=1TO255STEP4:SOUND1,-15,Q,1:NEX
T
   400FORQ=1TO1
   410IFX%(Q)=X AND Y%(Q)=Y THENGOSUB570
   411IF ABS(X%(Q)-X)<3 AND ABS(Y%(Q)-Y)<
3 THEN GOSUB 570
   420NEXT
   430COLOUR1:PRINTTAB(X,Y);"+";
   440ENDPROC
   450DEFPROCinv(X1,Y1)
   460X2=X1:Y2=Y1
   470X1=X1+(INT(RND(1)*3)-1)
   480Y1=Y1+(INT(RND(1)*3)-1)
   490IFX1<1THENX1=1
   500IFX1>19THENX1=19
   510IFY1<1THENY1=1
   520IFY1>20THENY1=20
   530COLOUR0:PRINTTAB(X2,Y2);CHR$(230);
   540COLOUR3:PRINTTAB(X1,Y1);CHR$(230);
   550X%(I)=X1:Y%(I)=Y1
   560ENDPROC
   570ND=ND+1:GCOL4,0:PRINTTAB(6,29);SC:S
C=SC+5*Q
   580COLOUR0:PRINTTAB(X%(Q),Y%(Q));CHR$(
230);
   590IFW>3ANDINT(RND(1)*8)-W)=1THENFU=97
0:GOSUB970
   600SOUND0,-15,6,20
   610X%(Q)=-1
   620FORZ=1TO400:NEXT
   630RETURN
   640DEFPROCinit
   650GCOL0,3
   660FORI=1TO200
   670PLOT69,RND(1)*1280,RND(1)*1024
   680NEXT
   690VDU29,150;900;
   700A=(2*PI)/30
   710GCOL0,2
   720B=A
   730FORC=1TO31
   740B=B+A
   750PLOT4,0,0:PLOT5,SIN(B)*40,COS(B)*40
:PLOT85,SIN(B-A)*40,COS(B-A)*40
   760NEXT
   770H=0
   780B=2*A
   790GCOL0,1
   800PLOT4,SIN(B)*100,COS(B)*15
   810FORC=1TO26
   820B=B+A
   830PLOT5,SIN(B)*100,COS(B)*15
   840NEXT
   850VDU29,150;895;:H=H+1:IFH<2THENGOTO7
80
   860VDU29,640;-800;
   870GCOL0,2
   880A=(2*PI)/100
   890B=11*A
   900FORC=1TO24
   910B=B-A
   920PLOT4,0,0:PLOT5,SIN(B)*1000,COS(B)*
1000:PLOT85,SIN(B+A)*1000,COS(B+A)*1000
   930NEXT
   940VDU23,230,65,62,107,62,28,36,66,129
   950VDU29,0;0;
   960GOSUB970:GOTO1000
   970GCOL0,1
   980PLOT4,290,10:PLOT5,990,10:PLOT85,99
0,50:PLOT4,290,10:PLOT5,290,10:PLOT85,29
0,50
   990RETURN
   1000X=10:Y=10
   1010XX=X:YY=Y
   1020FORI=1TONI
   1030X%(I)=INT(RND(1)*19):Y%(I)=INT(RND(
1)*22)
   1040COLOUR1
   1050PRINTTAB(X%(I),Y%(I));CHR$(230)
   1060NEXT
   1070FU=970
   1080ENDPROC
   1090VDU19,2,14;0;
   1100COLOUR1:PRINTTAB(6,29);SC
   1110IFNI<>7THENPRINTTAB(3,10);"NEW SCRE
EN"
   1120NI=NI+1:IFNI>7THENNI=2:ST=ST+5:PRIN
TTAB(3,10);"NEW WAVE":SCR=0:W=W+1
   1130FORG=1TO4000:NEXT
   1140CLG
   1150GH=INT(RND(1)*8):IFGH=1ORGH=0THENGO
TO1150
   1160VDU19,2,GH;0;
   1170PROCinit
   1180SCR=SCR+1
   1190GOTO80
   1200PRINTTAB(4,10);"SCORE=";SC
   1210FORD=150TO0STEP-3:SOUND1,-15,D,1:NE
XT
   1220SOUND0,-15,6,20
```

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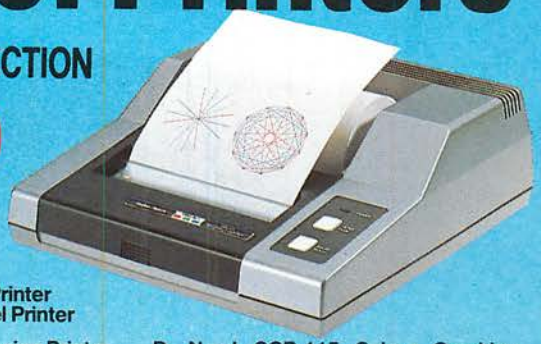

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ements	INPUT, PRINT, GPRINT, CURSOR, GCURSOR, PAUSE, USING, WAIT, CLS, IF . . . THEN, STOP, GOTO, ON . . . GOTO, GOSUB, ON . . . GOSUB, RETURN, ON ERROR GOTO, FOR . . . TO . . . STEP, NEXT, END, DIM, LET, REM, DATA, READ, RESTORE, BEEP, AREAD, ARUN, CLEAR, RANDOM, DEGREE, RADIAN, GRAD, BEEP ON, BEEP OFF
ctions	SIN, COS, TAN, ASN ACS, ATN, LN, LOG, EXP, DEG, DMS, RND, SQR (√‾), SGN, ABS, INT, PI (π), LEFT$, RIGHT$, MID$, ASC, VAL, LEN, CHR$, STR$, POINT
ables	A ~ Z, A$ ~ Z$, two-letter variables possible, two-dimensional arrays applicable
erations	+, —, *, /, (,), >, <, >=, <=, <>, =, ∧, AND, OR, NOT, &
ers	INKEY$, TIME, , ; : "

150 Printer

nmands	LLIST, TEST
tements	LPRINT, TAB, LF, ROTATE, COLOR, GLCURSOR, SORGN, LINE, RLINE, CSIZE, TEXT, GRAPH, LCURSOR

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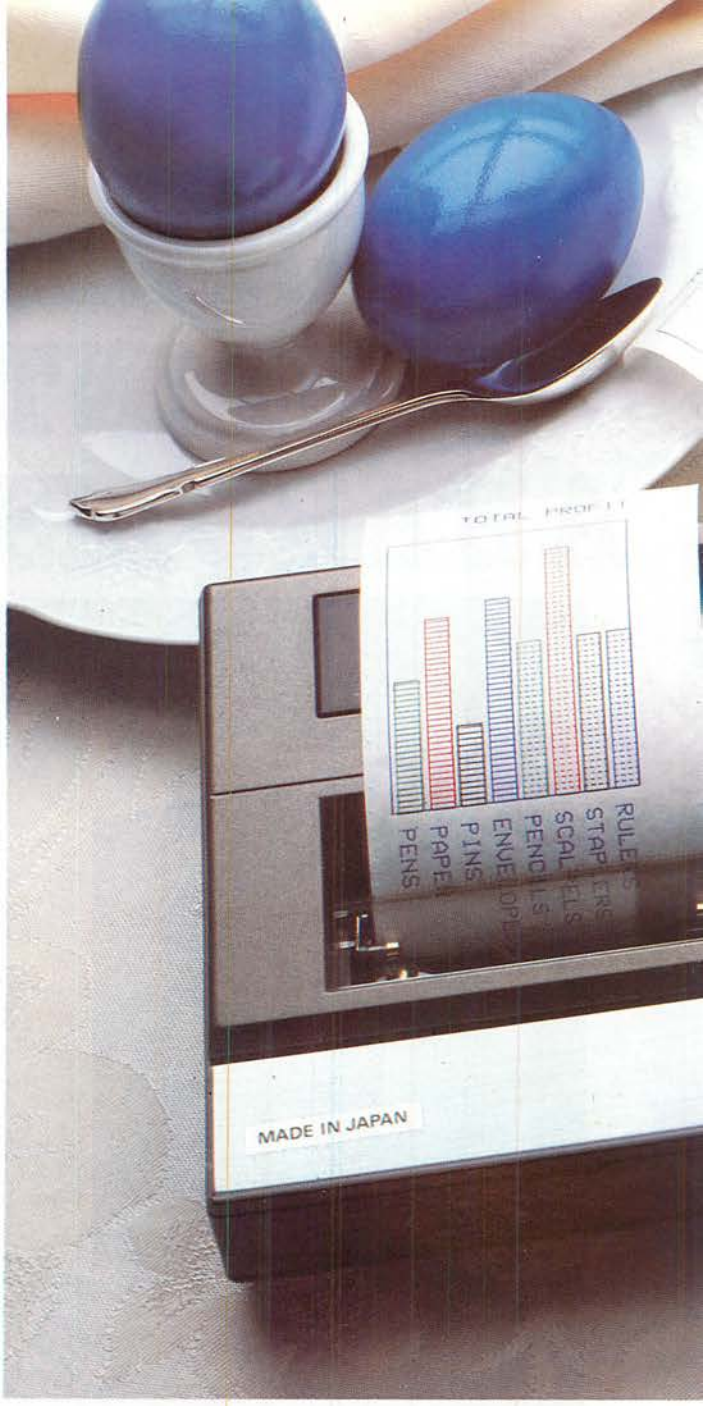

SPECIFICATIONS PC 1500

Number of calculations	10 digits (mantissa) + 2 digits (exponent)
Program language	BASIC
CPU	C-MOS 8-bit CPU
Capacity	ROM: 16K bytes RAM: 3.5K bytes expandable to 11.5K by
Memory protection	C-MOS battery back-up
Display	7 x 156 dots mini-graphic display (English upper- and lower-case letters, numbers, special signs, etc.)

CE 150 Colour Graphic Printer/Cassette interface (Optional)

Colour Graphic Printer	
Power source	Built-in rechargeable battery
Printing digits	Standard 18 digits (36, 18, 12, 9, 7, 6, 5, digits selectable)
Printing system	X-Y axis plotter system
Printing mode	Graph/Text switchables
Character sizes	9 different sizes from 1.2 x 0.8 mm to 10.8 x 7.2 mm (from 1/16" x 1/32" to 7/16" x 9/32")
Printing colours	Red, blue, green, black
Printing directions	Right, left, up, down
Minimum step width	0.2 mm (1/64")
Cassette Interface	Up to two cassette tape recorders can be connected

CE 151 Memory Module (Optional)

Capacity	4K-byte C-MOS RAM

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Capacity	8K-byte C-MOS RAM

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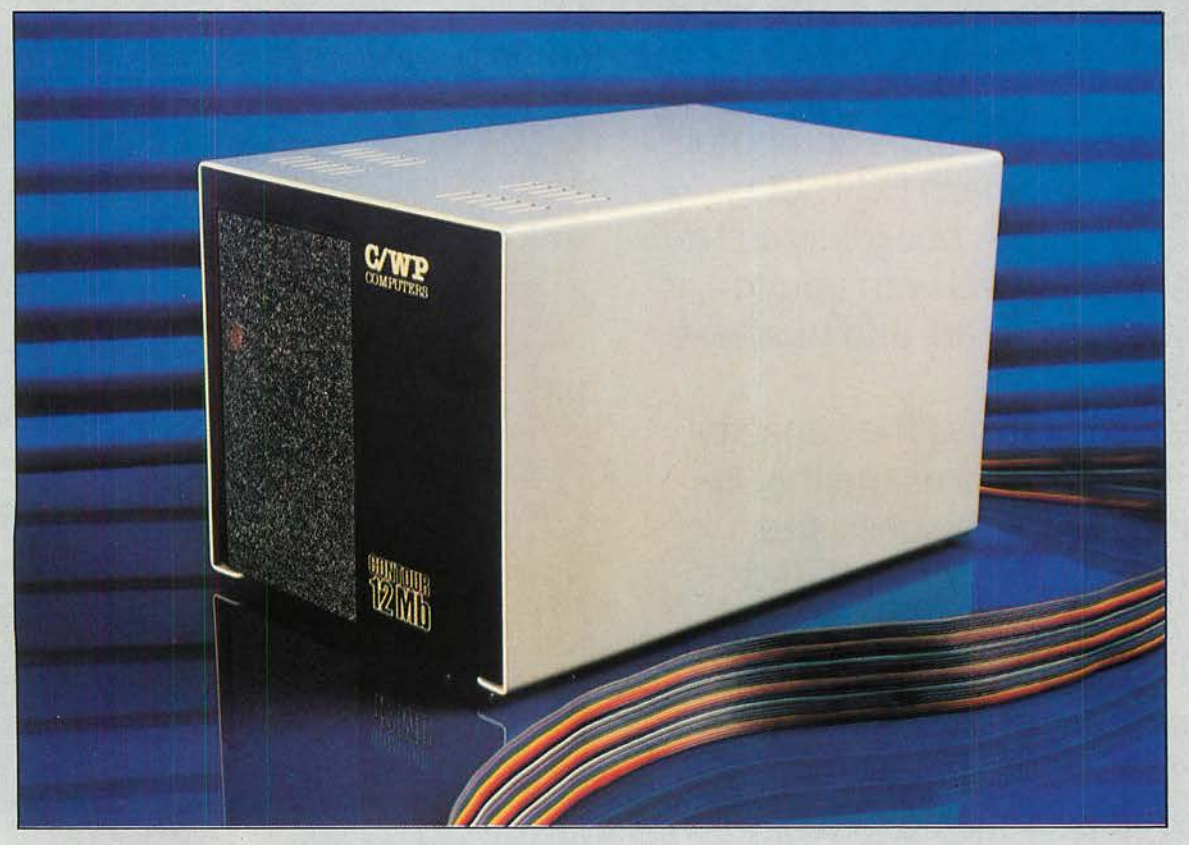

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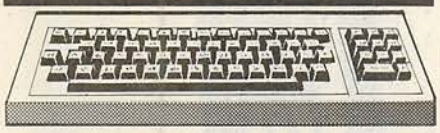

VDU23 designs

PUTTING THE LITTLE green man on to the mode 4 games screen has up to now involved me putting the dots on the eight-by-eight matrix through a paltry utility I cobbled together when the machine arrived. This has now passed on to that great archive in the sky whence no bit returns, and I have settled instead on a utility sent in by P Davidson of County Down.

Since he uses both mode 4 and 5 and allows both model A and B use, his listing has data names of more than average brevity, but the product runs in a very friendly way. When run, the program first asks which character you wish to alter, 224 to 255. It then uses mode 5 to handle a large-format eight-by-eight grid and also shows the character being built or amended in normal size to the right.

Active keys are cursor-up, right, down and left, C to colour a pixel and B to blank it. F is for finish, when you can go to another character or run out a VDU23 code string.

If you want to, it is easy to save the defined characters using

* SAVE name C00 D00

For those wishing to declare characters as an option within the games program itself I print a routine from J P Riggs of Gosport. This program draws the eight-by-eight matrix and allows you to turn pixels on or off with Y or N. The values for VDU23 are calculated and the character is defined for us. In order to allow you to define the character again, the values are printed on the right of the matrix before exiting the routine.

Tangle

The world used to be an analogue place which we handled with analogue processes. Since then we have seen a digital world which we handled with analogue processes, then with digital processes, and which we are coming round to handling with analogue processes once more.

In the days of the mainframe computer, before the white heat of the technological revolution enabled the affluent as well as the corporate among us to dabble, games programmers were fewer than today. Some were students making good use of their educational facilities, a very few were commercial programmers making illicit use of their employers' machines, but the majority built software for the manufacturers.

One result was the creation of games packages. A sales rep demonstrating the full capabilities of a machine to potential customers had the option of showing them existing sites and systems, existing available commercial software, or the games — and the games frequently won. Existing systems and commercial applications might take for ever to understand and appreciate, but the games rang the changes quickly and enjoyably, besides often being the only fully debugged programs to be had.

Consequently, among the ever-expanding library of games implemented on today's micros there exists the historical core of the old mainframe games. Some spread rapidly to every manufacturer's machines: programs like Startrek, Golf and the Cambridge-invented Life game. Some existed almost as a trade mark on a particu-

(continued on page 141)

VDU design 1.

```
>LIST
   10MODE4:DIM C(8,8),D(8):X=447:Y=575
   20INPUT"What is the character code of
 the"'"character you wish to redefine (>
223)"'chr
   30IF chr<224 OR chr<>INT(chr) OR chr>
255 THEN PRINT " INVALID INPUT":GOTO20
   40MODE5
   50VDU5
   60PROCscreen
   70*FX4,1
   80PROCreadchr(chr)
   90PROCind:PROCshow
  100*FX15,0
  110REPEAT dir=INKEY(0):UNTIL dir>0
  120IF NOT ((dir<100 AND dir>97) OR (di
r<68 AND dir>65) OR (dir<140 AND dir>135
) OR dir=70) THEN100
  130IF dir=70 THEN MODE4:PROCfin:RUN
  140IF dir=67 OR dir=99 THEN PROConoff(
85):GOTO90 ELSE IF dir<100 THEN PROConof
f(87):GOTO90
  150PROCshift:GOTO90
  160END
  170DEFPROCscreen
  180GCOL0,1
  190DRAW1023,0:DRAW1023,1023:DRAW0,1023
:DRAW0,0
  200FOR I=1 TO 7:MOVE I*128,0:DRAW I*12
8,1023
  210MOVE0,I*128:DRAW1023,I*128
  220NEXT:GCOL0,7:ENDPROC
  230DEFPROCind
  240MOVE X-16,Y:PLOT6,X+16,Y
  250MOVE X,Y-12:PLOT6,X,Y+12
  260ENDPROC
  270DEFPROConoff(fc)
  280MOVEX+52,Y-40:MOVEX-44,Y-40
  290PLOTfc,X+52,Y+52:PLOTfc,X-44,Y+52
  300C(INT((X+65)/128),INT(Y/128+1))=-1*
(fc=85)
  310PROCdef
  320ENDPROC
  330DEFPROCdef
  340I=INT(Y/128+1):D=0:FOR J=8 TO 1 STE
P -1
  350D=C(J,I)*(2^(8-J))+D
  360NEXT J:I=8-I
  370?((chr-224)*8+&C00+I)=D
  380PROCshow
  390ENDPROC
  400DEFPROCshow
  410VDU4
  420PRINT TAB(18,10);" ":PRINT TAB(18,1
0);CHR$(chr)
  430VDU5
  440ENDPROC
  450DEFPROCshift:PROCind
  460X=X+128*(dir=136)-128*(dir=137)
  470IF X<63 THEN X=63 ELSE IF X>959 THE
N X=959
  480Y=Y+128*(dir=138)-128*(dir=139)
  490IF Y<63 THEN Y=63 ELSE IF Y>959 THE
N Y=959
  500ENDPROC
  510DEFPROCfin
  520PRINTchr"="CHR$(chr)'"Do you wish t
o define any other"'"characters (Y/N)?";
  530PROCyn
  540IF ANS$="No"THENPROCs
  550ENDPROC
  560DEFPROCs
  570PRINT"Do you want the 'VDU 23' code
s (Y/N)?";:PROCyn:IF ANS$="Yes" THEN 600
  580*FX4,0
  590RUN
  600INPUT "For which character",c
  610IF c<224 OR c>255 THEN 600
  620PROCco(c):GOTO570:ENDPROC
  630DEFPROCreadchr(A):A=(A-224)*8+&C00
  640FOR I=0 TO 7:D(I+1)=?(A+I):NEXT
  650FOR I=8 TO 1 STEP -1:res=D(9-I):FOR
 J=8 TO 1 STEP -1
  660C(J,I)=res MOD 2:IF C(J,I)=1 THEN P
ROCdisplay(J,I,1)
  670res=res DIV 2
  680NEXT J:NEXT I
  690ENDPROC
  700DEFPROCdisplay(x,y,o)
  710MOVEx*128-16,y*128-108:MOVEx*128-10
8,y*128-108
  720PLOT85-2*(o=0),x*128-16,y*128-16:PL
OT85-2*(o=0),x*128-108,y*128-16
  730ENDPROC
  740DEFPROCco(c)
  750c=(c-224)*8+&C00
  760FOR I=0 TO 7:v=?(c+I):PRINTv:NEXT
  770ENDPROC
  780DEFPROCyn:REPEAT ANS$=GET$:UNTIL AN
S$="Y" OR ANS$="y" OR ANS$="N" OR ANS$="
n"
  790IF ANS$="Y" OR ANS$="y" THEN ANS$="
Yes" ELSE ANS$="No"
  800PRINT ANS$:ENDPROC
```

VDU design 2.

```
>LIST
   10*FX11,0
   200N ERROR RUN
   30DIM ROW(8),COLOUMN(8)
   40MODE4:VDU5:PROCbox:PROCinput:PROCfi
g
   50VDU23,CHAR,ROW(1),ROW(2),ROW(3),ROW
(4),ROW(5),ROW(6),ROW(7),ROW(8)
   60MODE4:INPUT LINE"ANOTHER CHARACTER
"A$:IF A$="Y" OR A$="y" RUN
   70*FX12,0
   80VDU12;4:END
   90DEFPROCbox
  100VDU12:PRINT"******     CHARACTER
 DEFINING      ******"
  110FOR X=150 TO 950 STEP100:MOVE X+50,
150:DRAW X+50,950
  120MOVE 200,X:DRAW 1000,X:NEXT
  130ENDPROC
  140DEFPROCinput
  150MOVE 50,100:INPUT"WHICH CHARACTER,
INPUT ASCII CODE ",CHAR
  160FOR ROW=1TO8
  170FOR COLOUMN =1TO8
  180MOVE(100+COLOUMN*100),(950-ROW*100)
  190DRAW(200+COLOUMN*100),(1050-ROW*100
)
  200in=GET:IF in=89 OR in=121 PROCfillc
alc:NEXT:NEXT:ENDPROC
  210 IF in=78 OR in=110 NEXT:NEXT:ENDPR
OC ELSE GOTO200
  220DEFPROCfillcalc:ROW(ROW)=ROW(ROW)+2
^(8-COLOUMN)
  230FORX=(100+COLOUMN*100) TO (200+COLO
UMN*100) STEP2
  240MOVEX,(950-ROW*100):DRAWX,(1050-ROW
*100)
  250NEXT:ENDPROC
  260DEFPROCfig:FOR ROW=1TO8:MOVE1005,(9
99-100*ROW):PRINT;ROW(ROW):NEXT
  270G=GET:ENDPROC
```

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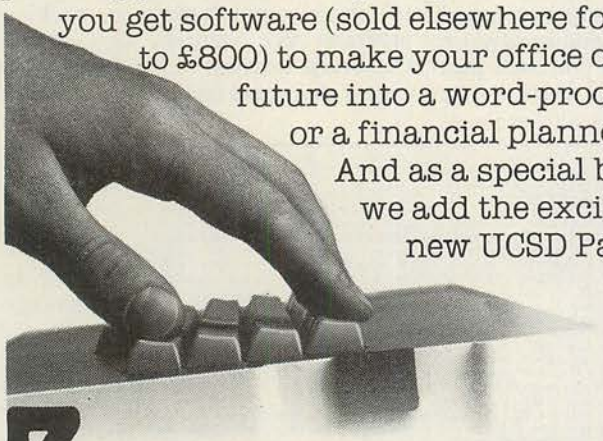

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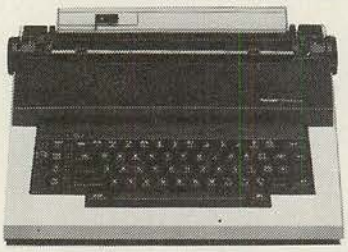

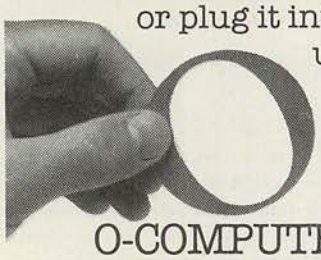

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• Circle No. 162

Date checker.

```
10 CLS:PRINT@448, "A Date in
format DD/MM/YY":INPUTD$: IF
LEN(D$)<>8 THEN 500
15 M$="JanFebMarAprMayJunJlyAug
SepOctNovDec"
20 D=VAL(LEFT$(D$,2)):
M=VAL(MID$(D$,4,2)):
Y=VAL(RIGHT$(D$,2))
30 IF D<1 OR D>31 OR M<1 OR M>12
THEN 500
50 A=(M=4)+(M=6)+(M=9)+(M=11)+
(M=2): IF A=0 THEN 80
55 IF D>30 THEN 500 ELSE IF M=2 AND
D>29 THEN 500
56 IF M=2 AND D=29 THEN IF
Y/4<>INT(Y/4) THEN 500
80 M$=MID$(M$,(M+(M-1)*2),3)
81 IF D=1 THEN DD$="st." ELSE IF
D=2 THEN DD$="nd." ELSE IF D=3 THEN
DD$="rd." ELSE DD$="th."
82 D$=STR$(D)+DD$:
Y$="19"+RIGHT$(STR$(Y),2):
90 CLS:PRINT@460,D$;" ";M$+".";"
";Y$
100 END
500 CLS:PRINT@448,"You have entered
the date incorrectly":FOR X= 1 TO
500:NEXT: GOTO 10
```

(continued from page 132)

program that requires users to enter data is to make sure that they enter valid data. One of the most common items entered is the date, and the following subroutine will make sure that it is entered correctly.

It will both check the validity of the date as entered in a DD/MM/YY format, using 0s to make up each pair as necessary, and translate it into English. After receiving the date in line 10, the string is checked to see that it is the right length. Line 20 takes from the string the value of the day, month and year. Line 30 checks that the value of the day is greater than 0 and less than 32 and the month is greater than 0 and less than 13.

Line 50 uses logical statements to check whether the month is a 30-day month. If so line 55 checks that D is not greater than 30, or if it is February and the day is 29 then line 56 checks that it is a leap year.

If the data passes all these tests line 80 selects the correct portion of M$ in line 15 for the month, line 81 chooses appendages for the day and line 90 prints the full date.

Arithmetical Input

P G Speller of Bingley, West Yorkshire points out that one of the few advantages that Level I Basic has over Level II is the ability to Input an arithmetical expression.

Time waster.

```
10 CLS:X=990: A$=CHR$(91):
B$=CHR$(8): D=1:H=1:Z=1
20 D=D*-1
21 V=V+1:IF V/10=INT(V/10) THEN Z=
Z+H: IF Z=8 OR Z=0 GOSUB 100
30 FOR C= 1 TO Z: PRINT@X,A$:
PRINT@X-66,B$:
PRINT@X-62,B$:X=X+D:NEXT:GOTO 20
100 H=H*-1: A$=CHR$(RND(63)+128):
B$=CHR$(RND(63)+128):RETURN
```

His program lets you do just that on a Level II machine.

Any expression containing predefined variables or real values can be Input at line 10 as a string. The address of the last line of the program is found in locations 16633 and 16634. The string is dissected into its ASCII components with the operators translated into their Basic token forms in lines 65440 to 65480. For instance, the character +'' is represented by ASC code 43 but the operation represented by + is held in a program as ASC code 205 — see line 65450. Line 65520, the final line, looks rather odd but type it in exactly as it is as it acts as a dummy. In line 65390 the 16 dots are cleared, and the series of ASC codes is then Poked into place and looks to the computer exactly as if the expression entered in line 10 had been typed into the 16 spaces following the = sign in line 65520. The operators *,/,+,− and exponent are all translated, and it is possible by slightly modifying the program to translate logical And — Basic ASC code 210 — and logical Or Basic ASC code 211 — as well.

One little thing about Mr Speller's account of his program puzzles me. He says that the line number chosen for the action line is the highest permitted in his 16K Level II machine to ensure that the program can find the right address. But locations 16633/4 give the program the right address anyway.

Arithmatical Input.

```
5 REM * LINES 10 - 20 ARE FOR
DEMONSTRATION USE.
6 REM * WHEN TYPING IN ROUTINE AUTO
LINE NUMBERING WILL
7 REM * NOT ACCEPT THE LINE NUMBER
65520: NUMBER IT BY HAND
10 CLS: INPUT"EXPRESSION";C$
20 GOSUB 65370
30 PRINT"VALUE RETURNED";C
40 END
65370 K1=PEEK(16633):K2=PEEK(16634)
 ' FIND PROGRAM END
65380 LE=K1+K2*256: ' COMPUTE
ADDRESS
65390 FOR N=1 TO 16:
POKELE-22+N,32:NEXT ' CLEAR ACTION
1INE
65400 LC=LEN(C$)
65410 FOR N=1 TO LC ' LOOP
TRANSFERS
65420 M$=MID$(C$,N,1)' THE
EXPRESSION
65430 M=ASC(M$)  ' BYTE BY BYTE

65440 IF M=42 THEN M=207' TO THE
ACTION
65450 IF M=43 THEN M=205' LINE (£
65520)
65460 IF M=45 THEN M=206' AMENDING
TO BASIC
65470 IF M=47 THEN M=208' INTERNAL
CODES
65480 IF M=91 THEN M= 209'AS
NECESSARY
65490 POKE LE-22+N,M
65500 NEXT N
65510 REM * ACTION LINE COMES NEXT:
LAST IN PROGRAM
65520 C=................:RETURN
```

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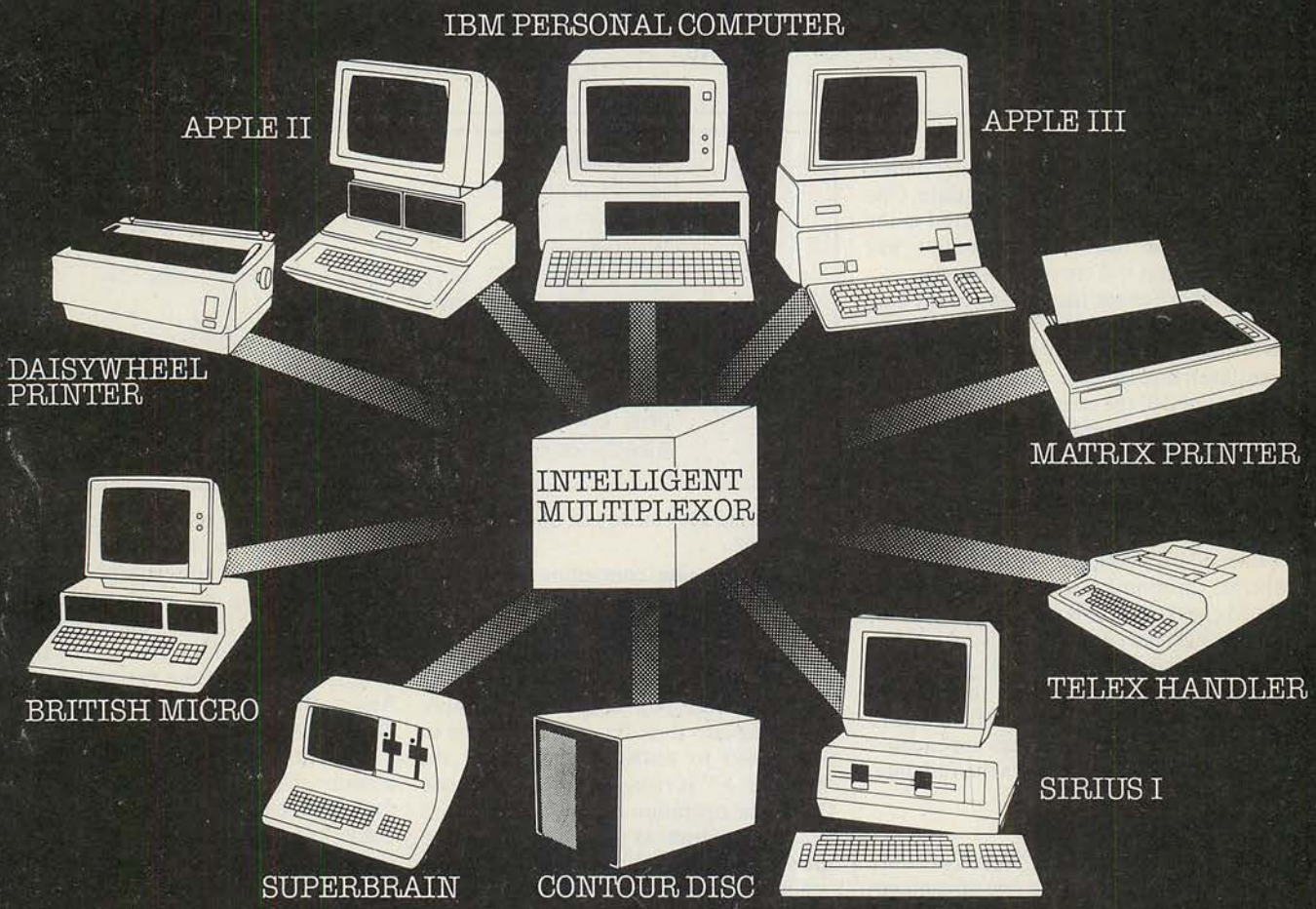

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• Circle No. 161

(listing continued from page 128)

```
480 PRINT"** FORECAST RESULT **"
490 PRINT"FIRST IS ";:GOSUB 20000
500 PRINT"SECOND IS ";:GOSUB 20000
510 PRINT"THIRD IS ";:GOSUB 20000
520 INPUT"ANY MORE RACES TO
FORECAST (Y/N)";AA$
530 IF LEFT$(AA$,1)="Y" THEN RUN
540 END
10000 PRINT"TYPE IN THE COURSE
CONDITIONS:
1=HEAVY,2=SOFT,3=GOOD-SOFT,4=GOOD,5=
GOOD-FIRM,7=HARD";
10010 INPUT CG:CG=INT(CG)
10020 IF CG<1 OR CG>7 THEN 10000
10030 RETURN
20000 HI=0:WH=0
20020 FOR X=1 TO CO
20030 IF VA(X)>HI THEN
WH=X:HI=VA(X)
20040 NEXT
20050 PRINT NA$(WH);" WITH ODDS OF
ABOUT";:OD=(OT-HI)/HI:IF OD<1 THEN
30000
20060 PRINT OD;"TO 1"
20070 VA(WH)=0
20080 RETURN
30000 OD=HI/(OT-HI):PRINT"1 TO";OD
30010 GOTO 20070
```

(continued from page 128)

If you are familiar with machine code and the inner workings of memory, you will need no instruction about how it works, but for those who are a little puzzled by things like Varptr (S5$), a few words of clarification may help you to use this subroutine.

First, you must declare the five string variables in line 400 before any other variables are defined. Line 400 only clears 1,100 bytes, but you will probably have to increase this for other parts of your program. Secondly, you must not use or redefine these strings. Lines 410 to 440 get things organised, and they can follow line 400 or go anywhere else, but they must do their thing before you start to save or call back a display.

Then get your display on to the screen and make a Gosub to line 600. The display is now saved into the space which memory is reserving for the five strings. You can now clear the screen and go on to some other operation in the program. All that has to be done to recall the display is to make a Gosub to line 700. You could reserve a number of pages, depending on the memory that you have available, to produce an animated display.

In this program the machine-language routine and the screen block are stored in memory reserved for them by the five dummy strings. This avoids the necessity of reserving memory and can be used for any relocatable machine-language routines.

Time waster

Mr S Andrews of Lowestoft, Suffolk has sent in a fun program for you to punch in and run. People can watch this sort of thing for hours, but how did it come to be written? Perhaps Mr Andrews thought it out in cold blood, worked out a flowchart and then typed it in. Or was he just messing about when something happened which gave him an idea to develop?

Date checker

One of the most important features of a

(continued on page 134)

Page storage.

```
400 CLEAR
1100:CLS:S1$=STRING$(210,32):
S2$=STRING$(210,33):S3$=STRING$(210,
34):S4$=STRING$(210,35):S5$=STRING$(
210,35)' CLEAR BUFFER - DONT CHEAT
410 SIZE =VARPTR(S5$):
ADDRESS=PEEK(SIZE+1)+PEEK(SIZE+2)*25
6:MSB=ADDRESS:IF ADDRESS>32767 THEN
ADDRESS=ADDRESS-65536
415 DEFUSR0=ADDRESS
420 FOR BUFFER=ADDRESS TO
ADDRESS+11:READ MACHINECODE:POKE
BUFFER,MACHINECODE:NEXT BUFFER
430 POKE 16526,ADDRESS AND 255:
POKE 16527,MSB/256
440
PAGESPACE=ADDRESS+12:LSB=PAGESPACE
AND 255: MSB=INT(PAGESPACE/256): IF
MSB<0 THEN MSB=256+MSB
450 PRINT@960,"******* YOU CAN DRAW
A GRAPH ON ONE 'PAGE' ...";:FOR X=0
TO
378:SET(X/3,SIN(X/30)*22+22):SET(X/3
,22):NEXT X: PRINT@1010,"PRESS A
KEY";
460 A$=INKEY$: IF A$="" THEN 460
470 GOSUB 600:CLS:PRINT@0,"YOU CAN
SWITCH TO NOTES":PRINT:PRINT"OR
EVEN A MENU OF
GRAPHS/DIAGRAMS":PRINT:PRINT"TO BE
SUPERIMPOSED -
INSTANTLY":PRINT@960,"TRY IT !";
480 IF INKEY$="" THEN 480
490 GOSUB 700:GOTO 460
500
DATA33,0,0,17,0,0,1,0,4,237,176,201
510' The Assembler code is a humble
Z80 block move, IE:
     21 ?? ??          LD
HL,WHEREFROM
     11 ?? ??          LD
DE,WHERETO
     01 00 04          LD
BC,1024
     ED B0             LDIR
     C9                RET
600 POKE
ADDRESS+1,0:POKEADDRESS+2,60 ' FROM
VIDEO RAM
610 POKE ADDRESS+4,LSB:POKE
ADRESS+5,MSB' INTO SAVE RAM
620 DUMMY=USR(0):RETURN
700 POKE
ADRESS+1,LSB:POKEADRESS+2,MSB 'FROM
SAVED RAM
710 POKE ADDRESS+4,0:POKE
ADDRESS+5,60 'TO THE DISPLAY
720 DUMMY=USR(0)
```

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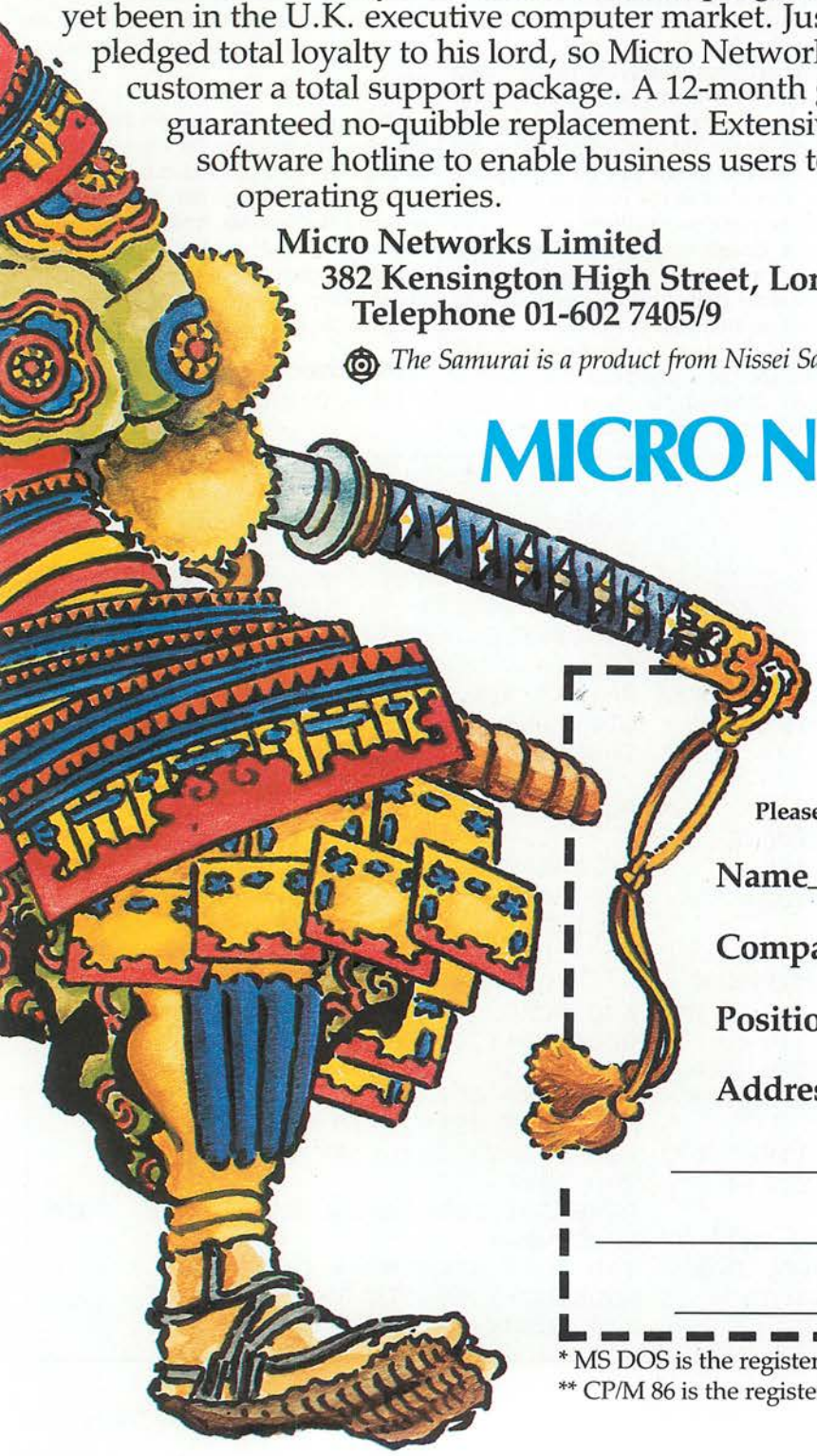

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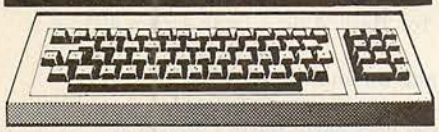
TANDY FORUM

by John Wellsman



Racing certainty

LAST MONTH I wanted to offer you a program which claims to help you pick out the winners on the turf. Caution prevailed, and before setting it before the world at large I tried it out very carefully, and strictly according to the author's ideas, on five races. I am not much of a punter, and would not ordinarily know where to get the information required, but with the help of a friend we got the necessary data and fed it in. To our surprise, the first, fourth and fifth came home and I showed a profit of £3.66.

I think I should remind you that the next five could easily have gone down. So Beware! Something more than computer programs are required to show a profit with the horses. We are indebted for this program to Mr G Smith of Farnham, Surrey.

Mr Smith says, "I feel it only fair to state that the program does not guarantee to find the winner for every race. What it does do when combined with a little common sense is to provide a reasonable chance of making an overall profit over a number of races."

The forecast depends upon a number of factors, two of which are the current position in the odds and the number of forecasts. From a purely mathematical point of view, other people's opinions — which is what these two factors consist of — do not in any way improve a horse's chances of winning.

I would have liked to see Mr Smith's program a little more compact, though he may say, justifiably, that its present form makes it easier to understand. But no one can dispute the fact that he has been too economical in the use of the CLS command.

I am a great believer in good presentation, though in the throes of composition this aspect tends to be forgotten. But once the program is finished you should run through it as objectively as possible, trying to see it as if for the first time. Make sure that the screen is frequently cleared and that it does not become cluttered with the answers to past Inputs unless it is necessary, and that instructions and unrelated Inputs are attractively positioned.

Page storage

The next program could be very useful to games writers and others who use visual displays. It is a routine which will enable you to store a screen or page of display and recall it instantly whenever needed. It was sent to me by Simon Goodwin of Hereford.

(continued on page 132)

Racing certainty.

```
1 CLEAR 1000
10 REM ** HORSE RACING FORECAST **
20 REM COPYRIGHT (c) G.SMITH MAY
1981
30 DIM NA$(50),VA$(50)
40 CLS:PRINT"** HORSE RACING
FORECAST **"
50 CO=1: GOSUB 10000: OC=CG
60 PRINT"TYPE IN THE NAME OF RUNNER
NUMBER";CO;:INPUT NA$(CO)
70 INPUT"TYPE IN THE LISTED
POSITION IN THE ODDS - 1 = FAV
ETC";PO:
80 PRINT"YOU HAVE NOW GOT TO ENTER
VARIOUS FACTORS TO CALCULATE HOW
WELL THE HORSE RUNS ON THIS
GROUND":FC=0
90 INPUT"ANY MORE PAST RACES FOR
DATA(Y/N)";AA$
100 IF LEFT$(AA$,1)<>"Y" THEN 220
110 GOSUB 10000
120 INPUT"TYPE IN THE POSITION IN
THAT RACE";AA
130 IF OC=CG AND AA=1 THEN
FC=FC+2:GOTO 90
140 IF OC=CG AND AA<4 THEN
FC=FC+1:GOTO 90
150 IF OC=CG AND AA<6 THEN 90
160 IF OC=CG AND AA>8 THEN
FC=FC-2:GOTO 90
170 IF OC=CG THEN FC=FC-1:GOTO 90
180 IF ABS(OC-CG)>1 THEN 90
190 IF AA=1 THEN FC=FC+1:GOTO 90
200 IF AA<6 THEN 90
210 FC=FC-1: GOTO 90
220 IF FC>10 THEN FC=10 ELSE IF
FC<-10 THEN FC=-10
230 INPUT"TYPE IN THE POSITION IN
THE LAST RACE RUN";P1
240 INPUT"TYPE IN THE POSITION IN
THE LAST RACE BUT ONE";P2
250 INPUT"TYPE IN THE POSITION IN
THE LAST RACE BUT TWO";P3
260 INPUT"TYPE IN THE POSITION IN
THE LAST RACE BUT THREE";P4
270 INPUT"TYPE IN THE CLASS OF
JOCKEY 1ST TO 4TH (1-4)";JC
280 INPUT"TYPE IN ZERO IF THE HORSE
IS CARRYING WEIGHTS AND 10 IF HE IS
NOT";WE
290 INPUT"TYPE IN THE NUMBER OF
TIPS THIS HORSE HAS BEEN GIVEN";TI
300 IF P1=0 THEN 320
310 P1=12/P1
320 IF P2=0 THEN 340
330 P2=12/P2
340 IF P3=0 THEN 360
350 P3=6/P3
360 IF P4=0 THEN 380
370 P4=6/P4
380 PO=PO+3
390 PO=60/PO
400 JC=12/JC
410 TI=TI/2
420 OT=P1+P2+P3+P4+PO+FC+JC+WE+TI
430 VA(CO)=OT
440 PRINTNA$(CO);" HAS BEN ASSIGNED
THE RATING OF";VA(CO)
450 INPUT"ANY MORE HORSES(Y/N)";AA$
460 IF LEFT$(AA$,1)="Y" THEN
CO=CO+1:GOTO 60
470 OT=0:FOR X=1 TO
CO:OT=OT+VA(X):NEXT
```

(listing continued on page 132)

● Circle No. 159

routine to draw a centralised box on the screen of an 8032.

It is written as a subroutine and requires C to be set to the number of columns and L the number of lines, including the border, that the box will contains.

By changing all occurrences of 80 to 40 the routine will work on a 4032 as well. It could even be modified to work on the Vic but would need an additional routine on the same lines to Poke the colour of the border, otherwise it would not be seen.

Vic colours

On the subject of the Vic, Michael Taylor of Bishop's Stortford has written a simple routine which will fit into one line and will flip the character and background colours on the Vic:

N = PEEK(36879):
POKE 36879, (N OR 8) AND NOT (N AND 8)

Tax payer

It's not long now before the end of the tax year. George Raven of Walton-on-the-Naze, Essex has sent a timely reminder in the form of a short program to help check that you have not paid too much tax.

The program asks for your taxable income, building society interest, where tax has already been paid at standard rate, and also for any charitable deeds of covenant you may have to take into account. It then asks for details of any allowances which you can set against tax and from this it calculates the net amount chargeable to tax and displays the amount of tax you should have paid.

By entering the amount actually paid the program will show you how much you have under- or over-paid. The details of rates of tax are in the Data statement of line 38 showing the tax bands and the percentage rate and these can be changed as the tax rates are adjusted by the Chancellor.

Although the program is fairly simple, it demonstrates one of the ways of getting round the problem of the Pet aborting the program and returning to the Ready mode if the return key is pressed without there being any input. It simply puts a decimal point where the input will start and then does three Cursor-left characters. When the Pet then prompts and waits for input it has a decimal point under the cursor and pressing the Return key immediately will return a value of zero to the input variable. So if you have nothing to enter against a particular item in the program just press Return and the program will continue with the next item.

The other programming trick is in line 16 where the horizontal (H) and vertical (V) co-ordinates of the input are Poked and a Sys is executed which will position the cursor at this position. The Input in line 17 then starts at these coordinates.

The Pokes and Sys are given for a 4032 small-screen Pet. For Basic 2 or 3 the Sys is

SYS57979

for Basic 4 on a large-screen 4032 it is

SYS57457

and on an 8032 it is

SYS57447.

On very early Basic 1 Pets it is

SYS58843

The Pokes are

POKE226,H

and

POKE245,V

There is a small bug in the program, affecting the screen layout. Because of the way the screen is cleared in line 14, the first line of allowances has a gap below it. The program works correctly, but it does look messy.

The string of spaces in line 8 contains 18 spaces, while in line 9 it contains 39.

Tax payer.

```
1 REM*********************************
2 REM*                               *
3 REM* INCOME TAX CALCULATIONS       *
4 REM*                               *
5 REM*********************************
6 DIMAL$(11),AL(11),TP(6),RT(6):TA=0:TT=0:TX=0:H=30:V=8
7 FORJ=1TO11:READAL$(J):NEXT:FORJ=1TO6:READTP(J),RT(J):NEXT
8 FORJ=1TO11:AL$(J)=LEFT$("■"+AL$(J)+"■                    ",29):NEXT
9 SP$="                                       "
10 PRINT"■"SPC(13)"■INCOME TAX■■■"
11 INPUT"TOTAL TAXABLE PAY FOR YEAR  .■■■";TT:PRINT
12 INPUT"GROSS BLG.SOCIETY INTEREST  .■■■";BS:PRINT
13 INPUT"AMOUNT OF CHARITY DEED      .■■■";CD
14 PRINT"■■■■■"SP$SP$SP$SP$SP$:PRINT"■■■■■ENTER YOUR ALLOWANCES":PRINT
15 FORJ=1TO11:PRINTAL$(J):NEXT
16 FORJ=1TO11:POKE198,H:POKE216,V:SYS57471
17 INPUT".■■■";AL(J):V=V+1:NEXT
18 PRINT"■■■■■ENTER ALLOWANCES AGAINST OTHER INCOME"
19 INPUT"■■■■UNTAXED INTEREST        .■■■";A3
20 INPUT"OCCUPATIONAL PENSIONS    .■■■";A4
21 INPUT"NAT.INS. BENEFITS        .■■■";A5
22 INPUT"OTHER ADJUSTMENTS        .■■■";A6
23 FORJ=1TO11:TA=TA+AL(J):NEXT:TA=TA-A3-A4-A5-A6:TX=TT-TA
24 PRINT"■■■NET AMOUNT CHARGABLE TO TAX■ ' =  "TT-TA
25 TP(1)=TP(1)+CD-BS
26 FORJ=1TO5:IFTX<TP(J)THENT6=T6+TX*RT(J):GOTO29
27 IFTX>TP(J)THENT6=T6+TP(J)*RT(J):TX=TX-TP(J):NEXTJ
28 IFTX>0THENT6=T6+TX*TP(6)
29 T6=T6/100:PRINT"■■■TOTAL TAX DUE = ";T6
30 PRINT"■■":INPUT"TOTAL TAX PAID  .■■■";XP
31 IFXP>T6THENXO=XP-T6:TT$="OVERPAID"
32 IFXP<T6THENXO=T6-XP:TT$="UNDERPAID"
33 PRINT"■■YOU HAVE ";TT$;XO
34 DATA"EXPENSES","DEATH & SUPERAN.BENEFITS","BUILD.SOC.INTEREST PAYABLE"
35 DATA"LOAN ETC INTEREST PAYABLE","PERSONAL","AGE ALLOWANCE","WIFE'S INCOME"
36 DATA"ADDIONAL PERSONAL","DEPENDANT REL.","WIDOWS BEREAVEMENT"
37 DATA"OTHER     "
38 DATA12800,30,2300,40,4000,45,6200,50,6200,55,0,60
```

Dog fight.

```
1 DIM C(8),Y(8),X(8)
2 FOR I=1 TO 8 READ C(I) NEXT
3 DATA 22,254,62,251,30,236,60,252
4 FOR I=1 TO 8 READ X(I),Y(I) NEXT
5 DATA 0,1,1,1,1,0,1,-1,0,-1,-1,-1,-1,0,-1,1
10 FOR T=920 TO 946 READ H POKE T,H NEXT
20 DATA 162,0,173,16,232,41,240,141,16,232,173,18,232,
30 DATA 73,255,157,132,3,232,238,16,232,224,10,208,240,96
40 PRINT "♥"
50 PRINT"QQQQQQQQQQ]]]]]]]]]]D O G F I G H T"
60 PRINTTAB(25);"QBY J.R.WILSON"
70 PRINT "QQDO YOU WANT INSTRUCTIONS"
80 GETA$ IF A$="Y" THEN GOSUB 970
90 IF A$="" THEN 80
100 PRINT "♥"
110 LX=INT(RND(1)*40) LY=INT(RND(1)*25)
120 RX=INT(RND(1)*40) RY=INT(RND(1)*25)
130 LK=INT(RND(1)*8) RK=INT(RND(1)*8) LS=20 RS=20
140 GOSUB 750
150 LX1=LX LY1=LY RX1=RX RY1=RY
165 TI$="000000"
169 IF LC=1 THEN  POKE 32768+LY1*40+LX1,102 GOTO 175
170 POKE 32768+LY1*40+LX1,32
175 IF RC=1 THEN POKE 32768+RY1*40+RX1,102 GOTO 190
180 POKE 32768+RY1*40+RX1,32
190 SYS 920
200 IF (PEEK(906)AND1)THEN LK=LK+1
210 IF (PEEK(907)AND1)THEN LK=LK-1
220 IF (PEEK(908)AND128) THEN RK=RK-1
230 IF (PEEK(909)AND64) THEN RK=RK+1
240 IF LK<1 THEN LK=8
250 IF RK<1 THEN RK=8
260 IF LK>8 THEN LK=1
270 IF RK>8 THEN RK=1
275 LX1=LX RX1=RX LY1=LY RY1=RY
280 LY=LY+Y(LK) LX=LX+X(LK)
320 IF LY<0 THEN LY=24
330 IF LY>24 THEN LY=0
340 IF LX<0 THEN LX=39
350 IF LX>39 THEN LX=0
360 RY=RY+Y(RK) RX=RX+X(RK)
400 IF RX<0 THEN RX=39
410 IF RX>39 THEN RX=0
420 IF RY<0 THEN RY=24
430 IF RY>24 THEN RY=0
435 RC=0 LC=0
440 IF PEEK(32768+RY*40+RX)=102 THEN RC=1
450 IF PEEK(32768+LY*40+LX)=102 THEN LC=1
460 IF RC=0 THEN POKE 32768+RY*40+RX,C(RK)
470 IF LC=0 THEN POKE 32768+LY*40+LX,C(LK)
480 IF (PEEK(906)AND2) THEN GOSUB 510
490 IF (PEEK(909)AND128) THEN GOSUB 620
500 GOTO 169
510 IF LS=0 THEN RETURN
520 LS=LS-1
530 A=Y(LK) B=X(LK) Y=LY+A X=LX+B
540 FOR R=1 TO 10
550 C=0 IF PEEK(32768+Y*40+X)=102 THEN C=1
560 IF C=0 THEN POKE 32768+Y*40+X,46
565 X1=X Y1=Y
570 Y=Y+A X=X+B
571 IF Y<0 THEN Y=24
572 IF Y>24 THEN Y=0
573 IF X<0 THEN X=39
574 IF X>39 THEN X=0
580 FOR I=1 TO 20 NEXT
590 IF C=0 THEN POKE 32768+Y1*40+X1,32
591 IF Y=LY AND X=LX THEN GOSUB 850 GOTO 650
592 IF Y=RY AND X=RX THEN GOSUB 850 GOTO 720
600 NEXT R
610 RETURN
620 IF RS=0 THEN RETURN
630 RS=RS-1
640 A=Y(RK) B=X(RK) Y=RY+A X=RX+B
645 GOTO 540
650 FOR I=1 TO 500
660 PRINT"♥QQQQQRTHE RIGHT PLAYER IS THE WINNER!■"
665 M=VAL(MID$(TI$,4,1)) S=VAL(RIGHT$(TI$,2))
670 PRINT"QQQ IN ";M;" MINUTES ";S;" SECONDS."
680 PRINT"QQANOTHER GAME?"
690 GETA$ IF A$="Y" THEN RUN
700 IF A$="N" THEN END
710 GOTO 690
720 FOR I=1 TO 500
730 PRINT"♥QQQQQRTHE LEFT PLAYER IS THE WINNER!■"
740 GOTO 665
750 FOR I=1 TO INT(RND(1)*3)
760 S=INT(RND(1)*3)+1
770 X=INT(RND(1)*40) Y=INT(RND(1)*25)
780 IF X<S+S OR X>40-S-S THEN 770
790 IF Y<S+S OR Y>25-S-S THEN 770
800 FOR Y1=Y-S TO Y+S
810 FOR X1=X-S TO X+S
820 POKE 32768+Y1*40+X1,102
830 NEXT X1,Y1,I
840 RETURN
850 IF Y=0 THEN Y=1
851 IF Y=23 THEN Y=22
852 IF X=0 THEN X=1
853 IF X=39 THEN X=38
859 P$=LEFT$("SQQQQQQQQQQQQQQQQQQQQQQQQQQ",Y)
860 FOR I=1 TO 5
870 PRINT P$;TAB(X-1);"\|/"
880 PRINT TAB(X-1);"-●-"
890 PRINT TAB(X-1);"/|\"
900 FOR J=1TO50 NEXT
910 PRINT P$;TAB(X-1);"R\|/■"
920 PRINT TAB(X-1);"R-●-■"
930 PRINT TAB(X-1);"R/|\■"
940 FOR J=1TO50 NEXT
950 NEXT I
960 RETURN
970 PRINT "♥                    RD O G F I G H T ■"
980 PRINT PRINT
990 PRINT"   THIS IS A GAME FOR TWO PLAYERS WHERE"
1000 PRINT"EACH PLAYER CONTROLS AN AIRPLANE ABOUT"
1010 PRINT"TO ENTER INTO COMBAT.THE IDEA OF THE "
1020 PRINT"GAME IS TO SHOOT YOUR OPPONENTS PLANE"
1030 PRINT"OUT OF THE SKY BEFORE HE GETS YOU."
1040 PRINT"THE LEFT PLAYER USES THE FOLLOWING "
1050 PRINT"CONTROL KEYS          Z ROTATE LEFT"
1060 PRINT"                      X ROTATE RIGHT"
1070 PRINT"                      C FIRE."
1080 PRINT"  THE RIGHT PLAYER USES THE FOLLOWING"
1090 PRINT"CONTROL KEYS        . ROTATE LEFT"
1100 PRINT"                    - ROTATE RIGHT"
1110 PRINT"                    = FIRE."
1120 PRINT"   EACH PLAYER HAS A MAXIMUM OF 20 "
1130 PRINT"SHOTS WITH WHICH TO GET THE OTHER"
1140 PRINT"PLAYER.ALSO.WATCH OUT FOR THE CLOUDS"
1150 PRINT"YOUR OPPONENT MAY BE HIDING IN THEM."
1155 PRINT PRINT PRINT
1160 PRINT"              RPRESS SPACE TO START■"
1170 GETA$ IF A$<>" " THEN 1170
1180 RETURN
```

(continued from previous page)
plane and must try to out-manoeuvre and shoot down his opponent. There are clouds shown on the screen and either plane can fly around in the clouds without being seen by its opponent, although it can still fire at enemy craft.

The game is based around a short machine-code routine which appeared in *Practical Computing,* December 1980, and allows any number of keys to be pressed simultaneously and still be detected by the program.

A couple of notes to help typing the program. First, there is a Home and 26 Cursor-downs in line 859, and 10 Cursor-downs and 10 Cursor-rights in line 50. Secondly it is important that all the Data statements are typed correctly, especially those in lines 20 and 30. If these two lines contain any errors, the Pet could hang up when the Sys920 in line 190 is executed. Saving the program on cassette or disc before you run it will at least ensure that you can recover if you have made a mistake.

You might also like to note that lines 150 and 275 are redundant as they are simply the same as having LX = LX and so on, and if you are feeling particularly enthusiastic some speed improvements could be made by changing all the occurrences of 32768 to SC and setting SC to 32768 at the start of the program.

Bordering on boxes

On the subject of routines and things which work on different machines, David Barratt of Blackpool has provided a short

Bordering on boxes.

```
100 REM    SUBROUTINE TO PLOT A CENTRALISED BORDER FOR 8032
110 REM    -------------------------------------------------
120 REM
130 REM  PARAMETERS REQD.  C = NO. COLS   :   L = NO. LINES
140 :
150 IF C<3 OR C>80 OR L<2 OR L>25 THEN RETURN  :  LIMITS EXCEEDED.
160 :
170 SC =32768+INT((80-C)/2)+80*INT((25-L)/2)
180 TL =SC           : TR =SC+C-1      : BL =SC+(L-1)*80  : BR =BL+C-1
190 POKE TL,112      : POKE BR,125
200 FOR  I=1 TO L-2  : POKE TL+80*I,93 : POKE BR-80*I,93  : NEXT
210 POKE TR,110      : POKE BL,109
220 FOR  I=1 TO C-2  : POKE TR-I,64    : POKE BL+I,64     : NEXT
230 RETURN
```

Open File

This regular section of *Practical Computing* appears in the magazine each month, incorporating Tandy Forum, Apple Pie, Sinclair Line-up and other software interchange pages.

Open File is the part of the magazine written by you, the readers. All aspects of microcomputing are covered, from games to serious business and technical software, and we welcome contributions on CP/M, BBC Basic, Microsoft Basic, Apple Pascal and so on, as well as the established categories.

Contributors receive £30 per published page and pro rata for part pages, with a minimum of £6. Send contributions to: Open File, *Practical Computing*, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Commodore Corner: One-line routines; Dogfight game; Borders and boxes; Vic colours; Income tax assessment — introduced by Mike Todd **125**

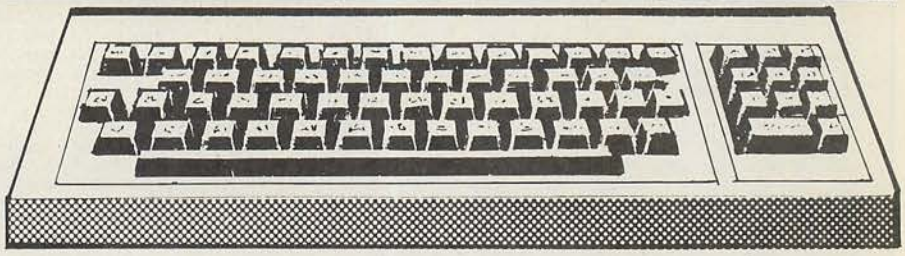
Tandy Forum: Racing certainty backs the winners; Paged storage; Date-checking routine; Inputting arithemtical expressions in level II Basic; Time waster — introduced by John Wellsman **128**

BBC Bytes: Designs using VDU23; Tangle game; Space Invaders; Bridge hand generator — introduced by John Morris **136**

Research Machines Review: Low-resolution graphics editor; Interpreter for Cesil learning language **141**

Sinclair Line-up: Reaction timer on ZX-81; Number formatter; Determinant evaluation on Spectrum **144**

Apple Pie: Security routine; Gilt-edged stock market assessment; Nine man morris game — introduced by John Wellsman **155**



Guidelines for contributors

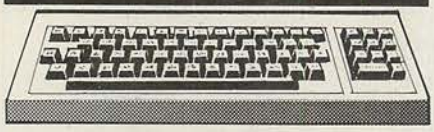
Programs should be accompanied by documentation which explains to other readers what your program does and, if possible, how it does it. It helps if documentation is typed or printed with double-line spacing — cramped or handwritten material is liable to delay and error.

Program listings should, if at all possible, be printed out. Use a new ribbon in your printer, please, so that we can print directly from a photograph of the listing and avoid typesetting errors. If all you can provide is a typed or handwritten listing, please make it clear and unambiguous; graphics characters, in particular, should be explained.

We can accept material for the Pet, Vic and Sharp MZ-80K on cassette, and material for the larger machines can be sent on IBM-format 8in. floppy discs.

COMMODORE CORNER

by Mike Todd



One liners

SIMPLE ROUTINES that will fit into a single line in Basic have always been popular with Pet enthusiasts. Not only do they take up little space, but they are often reasonably speedy in execution.

I have listed two of my own favourite one-line routines which I have been using for a long time. They convert a hex number to decimal and vice versa and are intended to be used as subroutines.

The routine to convert a decimal set up in variable D to hex in H$ is given in line 100. Note that for this routine to work, H$ must be a null string on entry. The routine for converting the hex number in H$ to decimal in D is given in line 200 and assumes no initial conditions set.

The routines are easily modified to convert from or to any other base simply by changing every occurrence of 16 to the base required. But be careful, if you want to convert to a base greater than 16 then the string of digits in line 100 will have to be extended and the whole thing may no longer fit on one line.

These are surely the shortest possible hex to decimal and decimal to hex routines — unless of course, you know any which are shorter still.

Dog fight

J R Wilson of Benfleet, Essex has written a simple game which can be played by two players. Each is piloting a

(continued on next page)

```
100 IF D THEN A=INT(D/16):H$=MID$("0123456789ABCDEF",1+D-A*16,1)+H$:D=A:GOTO100
200 D=0:IFH$>""THENFORI=1TOLEN(H$):A=ASC(MID$(H$,I,1))-48:D=D*16+A+(A>9)*7:NEXT
```

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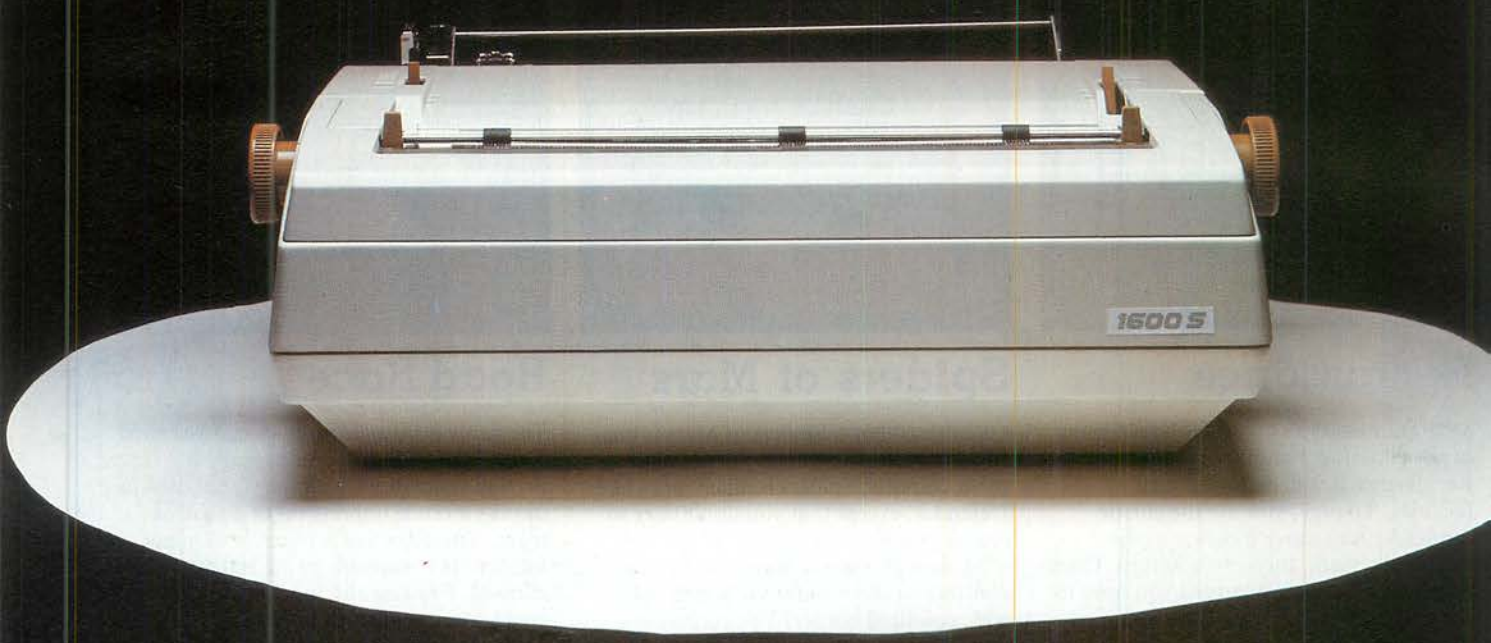

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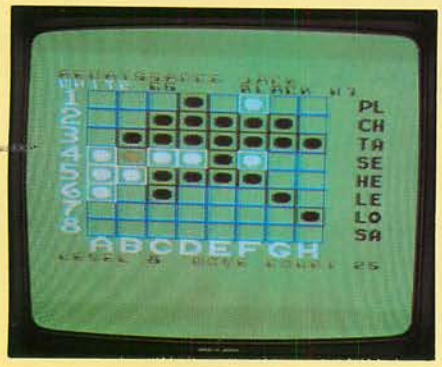
Vic-20 games

Jack Schofield plugs in to three ROM-based games.



Renaissance

ACTUALLY THE WELL-KNOWN board game of Othello, under another name, Renaissance is well endowed with facilities. To play, you use the cursor-control keys to move a cursor to the square you want, then press Return. Once your move has been accepted you have to press Return again to start the computer "thinking". This is somewhat tedious and could have been avoided.

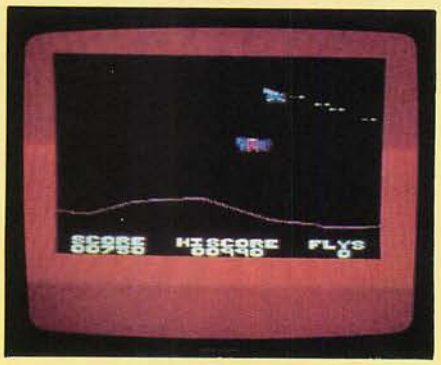
The graphics are quie acceptable, considering the limitations of the Vic itself. The sound, however, consists of electronic beeps which are only just this side of bearable. Quick players will probably turn down the TV sound.

The only other critical points are that the display does not give a score, and that you are not told if you have no legal move, or if you have only one legal move, or if the move you have made is illegal. Renaissance does not accept illegal moves, but neither does it help unless asked.

Renaissance does play a very good game of Othello. At the highest of its eight levels it wiped the floor with this reviewer — admittedly a beginner, but used to beating micros at the game. Unlike most microcomputer versions, Renaissance does not work through the board square by square when "thinking", but jumps around the main lines of play. Obviously some in-depth analysis takes place, and it would be interesting to see the algorithm used. Its playing strength makes Renaissance one of the better Vic games.

Specification

Type: Real-time board game with colour graphics and limited sound
Format: Plug-in ROM pack, VP-049
System: Unexpanded Vic-20
Manufacturer: Audiogenic (Software) Ltd, PO Box 88, Reading, Berkshire
Price: £19.95
Rating: 14/20



Spiders of Mars

LIKE CENTIPEDES, Spiders of Mars is bug-filled, but the two games are not alike in other respects. Spiders is much more like Defender, except that you don't have to rescue people.

Spiders of Mars is played within the confines of the normal Vic screen, with a wide coloured border. You control one sort of insect, and you are attacked by a lot of other insects. The spiders of the title lower themselves on threads from the top of the screen. Your task is to blast them all out of the sky, while dodging bullets and tiny white mines which converge on your blaster and destroy it.

You have three blasters for each game. The program keeps your score and the highest score. Ten levels of play are possible.

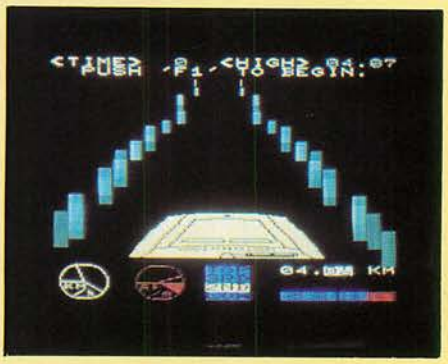
The great attraction of the game is that the action is fast and furious. The sound routines are quite good: the Vic makes a passable attempt at a phrase from Bach's Toccata and Fugue in D minor.

There are two main problems with the game. First, the enemies are detailed, multicoloured characters, but the inherent coarseness of the Vic's graphics, means they are too big for the limited screen area available for play. Smaller, simpler characters would have made a better game.

The ROM pack optimistically lists keyboard controls such as A for up and Z for down. The game is quite impossible to play this way, but with a joystick it becomes enjoyable.

Specification

Type: Arcade game with colour and sound
Format: Plug-in ROM pack, VP-014
System: Unexpanded Vic-20 plus joystick
Manufacturer: Audiogenic (Software) Ltd, PO Box 88, Reading, Berkshire
Price: £19.95
Rating: 13/20



Road Race

The game is misnamed: it should be called Time Trial. Road Race is actually a driving simulation, with the screen used to display a crude impression of a road at night. The objective is to cover as many kilometres as possible in the 100 time units allowed. Pressing the four function keys enables you to change up through the gears, while pressing Return — the accelerator — keeps up the revs. Steering is done with the A and D keys.

At the bottom of the screen is an instrument panel with a speedometer dial, a rev counter, gear indication and the distance covered. Road Race is quite realistic: if you change up with too few revs the engine dies, and you have to press I — the ignition — to start again.

The graphics are adequate but not very colourful. The road is a mere token, and lacks even a white line down the middle, which would have been useful.

The sound is also adequate but lacks excitement and invention. Crashing the car gives a disappointingly quiet bonk. After completing the course you are rewarded with a one-line tune, and it is a wretched little thing.

Road Race's main attraction is that it provides reasonably accurate simulation of driving, which should make it both interesting and educational for young children. Once this has been mastered, however, the game does not provide enough in terms of excitement or visual interest to make it gripping.

Specification

Type: Real-time driving simulation with graphics and sound
Format: Plug-in ROM pack Vic-1909
System: unexpanded Vic-20
Manufacturer: Commodore, 675 Ajax Avenue, Slough, Berkshire SL1 4BG
Price: £19.95
Rating: 9/20

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Casualty

(continued from previous page)

There are 62 possible variations on this one mode of analysis. Injuries treated in the unit can be coded using a simple set of injury codes, usually in the form of a three-digit number, each digit coding in turn the type of hospital emergency, the type of injury and the site of injury. One mode of analysis produces an overall summary of this information. A separate routine allows a researcher to pick out cases matching a specified set of injury codes.

One of the problems with operating the system is that not just one person, but a group of people must be adequately familiar with the system. Normally the resident clerk is on duty from 9am until 5pm, Monday to Friday. Cover in the evening till 10pm is provided by part-time staff and there is a rotation for Saturday and Sunday working. Taking into account holidays and sick leave, at least five people have to be familiar enough with the system to operate it.

Many of the difficulties encountered in the operation of the system centre round simple things such as incorrect insertion of floppy discs or inadvertently switching off the printer. Printers have been found to be the weakest link in the system. Fortunately there has always been a spare one to swap in as and when required.

After about 10 months of operation of the Computhink/MPI-92 unit, the drives became unstable and the Tandon unit was swapped in. The fault was eventually traced to an arcing contact on the Computhink power-supply board. To keep on top of possible disc problems, facilities were developed locally to align the disc systems. Once the initial aura of mystery of the floppy drive is overcome, the procedure is straightforward. Happiness is recovering lost programs and data. We found that excellent service facilities are available in the U.K. for both the Tandon and MPI drives through Hal Computers and Rack Data

It is typical for reports on medical computing applications to begin, "Our present system, though entirely adequate, is soon to be upgraded to a XYZ system to improve its performance". What this probably means is that the first system was never in operation long enough in a constant form to serve its intended purpose. The plans at present for the Bangor system are to maintain it in operation and make as much use as possible of the information it

In satisfying both of these aims, the concept of duplicate systems is of great importance, since useful analysis of data cannot really be done on the dedicated system used for patient registration, and it is convenient to have a spare system to swap in if required. For departments with a significantly greater workload — large centres can treat up to 100,000 patients a year — more than one registration unit would be required. Options of a multi-user system or a network of independent micros would be more appropriate there. A network would probably be the more flexible solution, taking into account the need to have facilities operating 24 hours a day, seven days a week.

The combination of the IT-82 initiative, the Körner Report on Health Service Information and general interest in the Bangor system has paved the way for the development of a "national" system. Such a task will be undertaken within Yorkshire Health Region, using also experience gained with an off-line accident and emergency system developed over several years at Leeds Royal Infirmary.

It has become evident from the experience gained at Bangor that a micro has all the inherent attributes needed for the success of a reasonably thought-out system. The weakest link in the chain is not the clock rate of the 6502 processor but the human organisation trying to use effectively its undoubted resources.

	Bytes	Comment
Consultant on duty	1	coded 1 of 3, set once each day
Time of presentation	2	coded (updated from Pet clock)
Date of presentation	3	coded
Patient name	25	24 characters text, plus one code for title
Patient address	30	all text
Telephone number	13	12 bytes text, code for home/work, etc.
Date of birth	4	coded, allows for 19th century
Age	2	coded : allows weeks, months or years
GP name	14	text
GP address	21	text
Occupation	14	text
Place of incident	1	coded, 31 options
Residential code	1	coded, six options
Referred by	1	coded, eight options
Complaint	20	text, input by receptionist
Revisit code	4	coded, includes previous visit number
Mode of transport	1	coded, four options
Casualty doctor	14	text
Medical coding	12	coded, allows for three injuries
Multiple injuries?	1	coded yes or no
Local anaesthetic?	1	coded yes or no
Diagnosis	37	text
Follow up	1	coded, 13 options
Unit Number	4	text
Clinic Date	3	coded
Spare	3	

Figure 1. Items of information stored in each patient record.

AGE GROUP(YEARS)	NUMBER	% OF VALID SAMPLES
0 <AGE< 5	231	7.84
5 <AGE< 10	272	9.23
10 <AGE< 15	368	12.5
15 <AGE< 20	379	12.8
20 <AGE< 25	310	10.5
25 <AGE< 30	250	8.49
30 <AGE< 35	197	6.69
35 <AGE< 40	184	6.25
40 <AGE< 45	148	5.02
45 <AGE< 50	105	3.56
50 <AGE< 55	108	3.66
55 <AGE< 60	91	3.09
60 <AGE< 65	86	2.92
65 <AGE< 70	64	2.17
70 <AGE< 75	54	1.83
75 <AGE< 80	36	1.22
80 <AGE< 85	27	.917
85 <AGE< 90	19	.645
90 <AGE< 95	10	.339
95 <AGE< 100	2	.067
100 <AGE< 105	1	.033

Figure 2. Analysis of workload by age for a two-month period.

casualty

It may sound like fiction, says Douglas Clarkson, but the on-line casualty record system at this hospital in Bangor, North Wales stores up to 20,000 cases each year.

Up to 3,400 patients' records can be stored on one floppy disc, available for instant recall and analysis.

package on day one: it took about three months before things had settled down and we had got around to ironing out various procedural difficulties.

Subsequently, a program incorporating various modes of analysis was developed, based on the design of a package previously written for a microbiology department. Various other smaller programs were written in due course, mainly for transferring data betwee discs and systems.

For most of the day the system churns out casualty cards, automatically storing the data on floppy disc. Another result of the system is that neat, legible casualty cards are available for everyday use. The log book is printed automatically by the system in batches of 50 entries.

One main area where the micro has made a useful contribution is the preparation of sorted lists in alphabetical order of name. In order to produce a sorted list of about 15,000 entries, data was transferred between an 8032 Pet with Computhink disc system and a Cromemco Z-2D system. Floppy discs were then taken to a Cromemco Z-2H system where, eventually, the final print was prepared using hard-disc facilities.

Even this more powerful machine took a total of 24 hours of continuous processing and printing to complete the task. The Pet system, because of practical difficulties, is only really able to sort up to 3,400 entries at a time. Information about previous visits of patients is now more readily available — "hospital hoppers" beware.

When data on disc is analysed, up to 6,800 entries can be scanned together. The user can select options from a lit of eight general types. A feature of the system is that an array of up to 10 command strings can be built up, permitting a set of such questions to be generated and allowed to run without subsequent user intervention. The first three characters of each command string alert the program to the specific function requested.

Recall of details of road-traffic accident cases is provided by the system. An analysis of the workload of the department by age is available.

The second figure shows a national pattern which is repeated locally. It tends to be the young, fit person between 15 and 35 who limps into the unit rather than the more placid senior citizen. A separate analysis can recall patients in selected age-groups.

The coded entries for place of incident, residential code, referred by, mode of transport and follow-up can be summarised in five neat tables. Another mode of analysis allows the recall of entries of a specific coding from a main group. For example, it is possible to select for recall all playground incidents from the place of incident category, or all follow up/admit unit cases.

(continued on next page)

Computerised

NO.	PATIENT NAME		D.O.B.	DATE	TIME	CONS.	SEEN BY	COMPLAINT	FOLLOW UP
H0001	JOHNSON LINDA	(MISS)	12-02-1955	08-02-82	09.51	TAE	Dr.WALTERS	INJ FOOT	DISCHARGED
H0002	KELLY TINA	(MISS)	12-03-1896	08-02-82	09.57	TAE	Dr.WALTERS	INJ HIP	ADMIT UNIT
H0003	RODGERS FIONA	(MISS)	12-03-1969	08-02-82	09.20	TAE	Dr.WALTERS	INJ HEAD/LEG/ABDO	ADMIT OTHER UNIT
H0004	MOORE GRETA	(MISS)	12-07-1968	08-02-82	10.26	TAE	Dr.WALTERS	INJ ANKLE	DISCHARGED
H0005	PARKES MICHAEL BRIAN	(MR)	12-08-1937	08-02-82	10.45	TAE	Dr.WALTERS	PAIN IN TOE	G.P DEFINITE
H0006	GOODING ANGELA	(MISS)	12-03-1954	08-02-82	11.15	TAE	Dr.WALTERS	PAIN IN FOOT	G.P. IF REQUIRED
H0007	THORN BILLY	(MR)	02-06-1959	08-02-82	11.37	TAE	Dr.		*REVISIT* G 1555
H0008	THOMAS MARY JONES	(MRS)	02-03-1950	08-02-82	12.00	TAE	Dr.WALTERS	CHEST INJ	ADMIT UNIT
H0009	SMITH ALLAN PARKES	(MR)	12-02-1955	08-02-82	10.20	TAE	Dr.WALTERS	INJ HEAD/SHOULDER	ADMIT UNIT
H0010	PARRY ELIZABETH	(MISS)	12-03-1969	08-02-82	13.06	TAE	Dr.AUNG	INJ ANKLE	FRACTURE CLINIC
H0011	GRIFFITHS JOHN MICHAEL	(MR)	12-03-1957	08-02-82	13.16	TAE	Dr.AUNG	HEAD INJ	G.P DEFINITE
H0012	BROWN BRIAN	(MR)	12-03-1955	08-02-82	11.00	TAE	Dr.WALTERS	ABSCESS	ADMIT OTHER UNIT
H0013	WILLIAMS MONA	(MRS)	12-06-1921	08-02-82	13.55	TAE	Dr.		*REVISIT* G 1514
H0014	JONES THOMAS JOHN	(MR)	12-03-1946	08-02-82	12.46	TAE	Dr.AUNG	BACK INJ	DISCHARGED
H0015	DAVIDSON RUTH	(MRS)	12-03-1921	08-02-82	14.19	TAE	Dr.AUNG	CHEST INJ	DISCHARGED
H0016	EVANS GERAINT JOHN	(MASTER)	15-02-1969	08-02-82	14.30	TAE	Dr.AUNG	CUT EYEBROW	DISCHARGED
H0017	BRUCE ANNE	(MRS)	12-09-1960	08-02-82	15.17	TAE	Dr.AUNG	NOSE BLEED	RETURN A.U. IF REQ.
H0018	JONES JANET ANNE	(MRS)	12-03-1922	08-02-82	12.30	TAE	Dr.WALTERS	COLLAPSED	ADMIT OTHER UNIT
H0019	JACKSON MYRA JANE	(MISS)	12-03-1970	08-02-82	15.31	TAE	Dr.AUNG	CUT FINGER	DISCHARGED
H0020	ASHTON THOMAS SMILIE	(MR)	19-06-1951	08-02-82	15.49	TAE	Dr.AUNG	REMOVAL SUTURES	DISCHARGED

Logbook printout for a six-hour period; the medical staff and further details after treatment.

"NAME PLEASE" asks the casualty receptionist.

"Edward Parry" an anxious parent replies, restraining a toddler with a badly grazed arm.

"Date of birth? Age? How did it happen? Who's your own doctor?", asks the receptionist, taking down details of the incident.

"Take a seat over there. The doctor will see you shortly."

As the anxious group is sitting down in the waiting area, a daisywheel printer begins printing a casualty card and a floppy disc whirs into action as the information is stored, ready for the next patient. The first on-line casualty record system in the U.K. has gained another entry. And so it goes on for up to 20,000 cases each year at the C and A Hospital, Bangor, North Wales.

It is obvious that an important part of a casualty department is an efficient records system. If Joe Bloggs comes back six months after an initial injury, it is important to access the old record readily. One drawback of the accident unit in Bangor is its very limited size for storing manual records.

To alleviate the problem David Jones, a consultant in charge of the accident unit, was keen to introduce a locally developed casualty record system using a microcomputer. While computers were not by any means new to casualty departments, two new directions were planned. Firstly it would be a micro that would be used, and secondly the collection of data would be on-line as the patient attended at the reception desk asking for treatment. After David Jones had initiated the concept, the task of supervising the development from a medical angle was taken by Rhys Gray, then an Orthopaedic Registrar. General hardware and software developments were undertaken by Douglas Clarkson of the local medical physics department.

In previous applications, the department had opted for Pets with Computhink floppy discs, and in mid-1980 a Computhink system running on a 3032 Pet and incorporating twin 80-track double-sided MPI-92 drives giving 1.6Mbyte of disc storage had been obtained as a general-purpose machine. It was decided to begin developments around this system so that no time would be lost waiting for a specific set of equipment to be assembled as and when funds became available to the accident unit. A second-hand 1620 Diablo daisywheel printer was added to complete the system. Eventual funding for the project was provided by the local health authority research committee.

Duplication thwarted

Plans to obtain a duplicate system of Pet and floppy drives were thwarted when ACT, then sole U.K. agent for Computhink drives, gave up its dealership. Part of the problem seemed to be the introduction by Commodore of Basic 4 which delayed Computhink bringing out a compatible disc operating system. After a delay of several months, Stack Computers managed to obtain a disc system, this time with Tandon 80-track drives which could run on an 8032 Pet.

A significant feature of the first system was the remarkable stability of the MPI disc unit, which was in use 24 hours a day seven days a week in its on-line role. With its dust and general human abuse, the environment in the accident unit can only be described as hostile.

Choice of language for the application was academic. Pet Basic was found to lend itself remarkably well to the complex task of implementing the system. To keep things simple no machine-language routines were used to tweek system performance.

Patients' records

Figure 1 describes the items of information which can be stored for each patient. Initially there is the need to identify the patient, to record details of where and how the incident happened and what the complaint is. After treatment, input from the casualty doctor as regards type of injury, diagnosis and outcome of the visit are added to the initial entry. It is obvious, however, that the longer the list of data items the greater the burden on the reception clerk and the more dubious the data will become. In typical busy departments, the on-line data gathering would only seem to be practical when done as a by-product of the normal registration procedure.

Up to 3,400 patient records, each 233 bytes long, can be stored on one floppy disc. A small file which keeps a record of the next new casualty number to be allocated is updated after each new patient registration. The absolute position of each patient record on disc is determined directly by the casualty number, which acts as the main key to the system.

While all the data files are structured for random-access use, for the purpose of analysis they can be read in sequential mode. This greatly increases the speed of reading of data: 1,000 full records can be brought into memory in about 100 seconds.

After two months of spasmodic development, the system was actually alive and well and registering patients just before Christmas 1980. The success of the venture is due in no small way to Linda Roberts, the full-time receptionist at the unit. We did not really hit her with an all-singing all-dancing

un-ignorable person. Aged 62 and weighing 16 stone, Mrs Jamieson moved through the community with the consideration and finesse of a medium-sized asteroid. Universally disliked but held in some kind of awe by those who failed to make a dent in her self-confidence, she was obviously in a fighting mood. Paul groaned inwardly.

"Since my rates are paying for this, let's keep it as straightforward as possible, shall we? My husband and I have decided to invest in a new Conintental Prestel adaptor, a Conintex model 6, and we would like you to check the connection to our system."

"I do think that the distributor's engineers can do as good a job installing the unit when it comes as I can, Mrs Jamieson."

"When? Young man, the unit was delivered last week, and Frank and I installed it over the weekend. Now I need your test facilities to confirm our complaint."

"Very well Mrs Jamieson, now if you will put your system in Engineer mode, I can give you a full fault diagnosis." The old fool must have screwed it up. Installation consisted of plugging in two multilayer optical cables. Surely even she could get that right.

"I'm afraid the Engineer switch is broken at the moment. You'll have to do it from your end."

Switch? What switch? he caught a glint in the woman's eye, and it was worrying him.

"Your audio link?"

"Is being used for something else. Please get on with it, I don't have all day, you know."

"Very well, Mrs Jamieson."

Paul dragged the keyboard on to his knees again and began to build up the command sequences needed to force entry to another system. He noticed that he had been unconciously shielding his actions from the monitor where a larger-than-life Mrs Jamieson seemed to be intent on studying his keystrokes.

He pressed Send and turned to the screen.

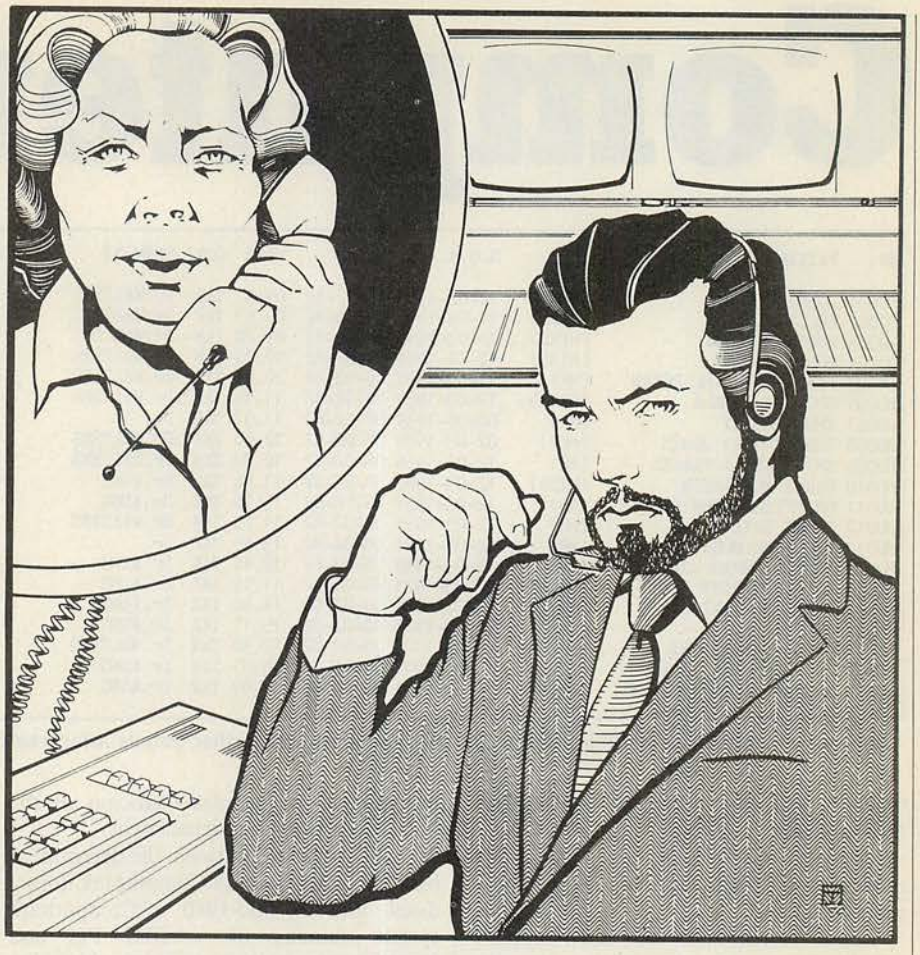
"Is there anything on your main monitor?"

The face suddenly looked startled, worried, then settled on suspicious. "Security breach. Just what are you doing, young man?" Then, "It won't work. Frank and I installed security monitors on all the inputs to the system."

Paul ignored her, staring at his own screen.

SUSPECTED ENCRYPTION DEVICES BACK-DOOR?

He typed Yes and began chewing his beard again. That should fix the old bat, he muttered to himself, I bet she doesn't know you can connect to another machine by modulating the mains power. Slow but reliable.



The penetrating voice began again "Engineer mode?" It was noticeably worried now. "Just what have you done? I demand to be told."

"Sorry, Mrs Jamieson, industrial security. I'm sure you understand." He typed a few more codes.

ENCRYPTION CONFIRMED.
ALL COMMS INPUTS CONNECTED TO DATA FILE>STEALENG14<
ALL MANUAL CONTROLS NOW DISABLED

Paul looked up. The phone screen was showing an orderly kitchen with no one in sight. He used the keyboard again.

ENCRYPTION DISCONNECTED
RESPONDERS ABANDONED
FILE>STEALENG14< DESTROYED
FILE DIRECTORY TRANSMITTED
SECURITY SYSTEM INSTALLED AND IDLING

Now that things were as they should be, he used vocal commands again.

"Transmit and execute configuration check."

The mellow contralto confirming the order was almost drowned by the 16-stone voice.

"Why can't I control my machine? What have you done? I insist on being told, I have my rights you know. You have no legal right . . ."

For the first time since he had taken the job, Paul was close to losing his temper.

"I have a taped request from you that I effect a forced entry to your system and check for some unspecified fault. I have done and am doing just that. Now if you would care to look at screen 2 I will go through the report with you.

"First, your speech synthesiser appears to have some 17 components missing. Second you appear to have disabled your reconfiguration controller which, as you are aware, invalidates your hardware maintenance clause. Your reliability is currently 47.2 percent, and reconfiguration capacity nil. Finally, the connector for your Continentex adaptor apppears to upside down.

"Copies of this report are being sent to area hardware support and the local Technology Centre as well as being printed here and in your home. An engineer will contact you to arrange a time and fee for making the repairs. If there is nothing else?"

He typed Destroy on the keyboard and hovered over Send.

The face on the phone tried to rally some strength.

"I am not in the habit . . ."

He pressed Send to remove all trace of the test software from the other machine and switched off the phone. The clock said 11.37 as he stood and stretched, then turned to the door for more coffee. Software piracy, he thought, she should have been more sensible. After all, where did she think his software came from?

Just another day

by Paul Wilson

It was ten past eight when the alarm went off, rudely hauling Paul Rawlins back to wakefulness.

"It's eight o'clock Paul, time to get up." The voice started as a mellow contralto, gradually deepening and coarsening to a New Jersey drawl as it went remorselessly on.

"Your first appointment is in 75 minutes."

The covers on the other side of the bed moved back to show a mane of auburn hair and a pair of sleepy green eyes.

"If you don't fix that audio link I'll lobotomise it," grumbled Steph.

As Paul filled an ancient electric kettle from the tap, he wondered for the hundredth time how many of his customers would desert him merely for seeing him using anything that archaic. An area softfware support engineer was expected to be up to date. As he plugged in the kettel the radio switched to the technology channel.

". . . and with the commercial acceptance of the Gilbertson mono-molecular gate, single chip, multi-megabyte systems with full virtual storage are an estimated five to 10 years away. The Ministry of Technology . . ."

Paul grunted disgustedly: 2017 and still the same old rubbish as 45 years ago.

Later as Paul strolled across the living room towards the office, he stopped on impulse and crossed to Steph's audiovisual console, powered it up and played the start of her latest composition. The AVC was a part of the house network he rarely used.

Paul switched it off with a sigh, making a mental note to ask for a private performance before it was published, and went into the office, where he sat down in front of the bulk of the house computer net.

"Diary. First two appointments."

Again, the contralto migrated to New Jersey.

"Nine-fifteen, Matheson Brothers for an annual system check; 10.30, Mrs Jamieson wants advice about the new Continentex adaptors."

"Engineering software. Audio link test. Execute."

The screen facing the chair glowed with green letters.

PAGE 176
ENGINEERING SOFTWARE 160706.0
AUDIO LINK TEST

Two orthogonal axes appeared, then a light-blue line — the ideal frequency response. Seconds later a deep-blue line was almost exactly superimposed.

AUDIO LINK
TEST COMPLETE
RESULTS ACCEPTABLE

"New program. Audio link duration test."

SPECIFY PLEASE

Paul pulled the keyboard towards him. It was easier and safer to define the sequence of tests he needed manually, especially when it was a non-working audio link which was going to be tested. Ten minutes later he sat back and pulled at his beard reflectively, then after a pause: "Complete."

TO BE SAVED?

"Defer. Execute."

AUDIO LINK DURATION TEST

Again the orthogonal axes and the light-blue line were drawn. This time the darker line was 30 seconds in coming.

FREQUENCY DETERIORATING WITH TIME.

A slight pause.

GATE F2B17, ACTIVATION VOLTAGE LOW.

"Reconfigure."

DONE. **WARNING — SYNTHESISER MODULE F2,
RECONFIGURATION CAPABILITY 12%.

Paul frowned, 12 percent, that was far too low.

"Configuration summary."

6 PROCESSORS, 4MBYTE RAM,
204 PAGES OF SOFTWARE
3 AUTO-LOADING VIDEO DISCS, 2 FAST PRINTERS
8 SCREENS, COMMS LINKS, AVC
SYSTEM RECONFIGURATION POTENTIAL 20.96%

"Hardware failure summary showing manufacturer."

There it was, the uncommitted logic array chips from the new Korean-European conglomerate had an astrononical failure rate. He added a footnote to the diary, wondering how many other areas were having similar troubles. Perhaps he'd call a couple this afternoon.

"Mr Matheson is calling." The contralto stayed well away from New Jersey as the system interrupted his broodings.

"Hold. Save audio link duration test."

SAVED
PAGE 176, ENGINEER — AUDIO LINK — DURATION TEST.

"Connect." He frowned, glancing at the clock. It was unlike Peter Matheson to be early.

"Morning Paul, you're not usually late — it must have been a good party last night."

"It was Steph's birthday." he said defensively, making himself a note to check the machine's clock later on.

Matheson laughed good-naturedly. "Tell Stephanie that we saw her Starlight symphony the other evening, will you? It was brilliant, Jan was almost in tears."

"Thanks I will. Now how's your system behaving?"

"In remote for you. By the way, the VAT people don't like the breakdown they get from the Systez package. Do you have anything else that's more suitable?" Paul grinned sympathetically. Peter Matheson's battles with the VAT centre were almost legendary.

The best I can offer you is Systez 5.7; you're running with 4.1, I think. It's their own fault anyway, 17 VAT rates and five exception conditions. The whole thing's ludicrous." He glanced at the screen in front of him.

SYSTEM RECONFIGURATION
CAPABILITY 13.7%

He typed a few characters.

ULA FAILURE 1,724% ABOVE NOMINAL.
EU-KOR SUPPLIES.

Again those damn chips.

"Peter, I'll have to ask a hardware engineer to call. You're having trouble with those Korean chips, like a lot of other people. I'll make an official complaint, so your insurance won't have to pay. Any particular time suit you?"

"Late afternoon if he can. Can I have 5.7 to try?" He paused. "Oh yes, Jamie says have you got the latest version of Avatar, or a new game called Timedrop?"

Paul turned slightly towards the chair microphone: "Query, games, Avatar and Timedrop."

The reply came on the screen.

GAMES — AVATAR 2.3
TIMEDROP — NO REFERENCE FOUND

"Avatar 2.3 I have, Timedrop I don't. I'll try and trace it for him if you like. I'd like to see him win the championship."

He turned to the speaker again, "Avatar 2.3 and Systez 5.7, transmit."

Twenty minutes later, his system check complete, a satisfied Matheson rang off. Glancing at the clock, Paul muttered darkly to himself and began a thorough check of his own system, starting with the real-time clock.

Paul, Mrs Jamieson is on the line." The voice broke into his thoughts some time later.

"Connect." He stole a look at the clock, 10:29:56; as usual the old dragon was irritatingly precise. "Good morning Mrs Jamieson, how are . . ."

Politeness was brushed aside by a loud, penetrating voice belonging to an equally

Table 1.
OLSQ with dependent variable CONSN.

VAR	COEFF	S.E.	T STAT		
CONSTANT	2344.75	2176.66	1.07723	ASR =	2517.18
INCOME	.541431	.0951742	5.68885	SR =	– 105.281
CONSNL	.386002	.140561	2.74614	DW =	1.71225
INF	– 135.355	47.5855	– 2.84447	RBSQ =	0.993263

Table 2.
OLSQ with dependent variable Y.

VAR	COEFF	S.E.	T STAT	ASR =	88.05
CONSTANT	14.4368	5.38378	2.68153	SR =	– 0.0203781
T	.174438	.084246	2.07056	DW =	1.95698
YL1	.673987	.115470	5.83688	RBSQ =	0.80838
YL2	.130049	.139270	.93379		
YL3	.149864	.139811	1.07191		
YL4	– .181923	.115470	– 1.57541		

possibility that the standard errors will be biased downwards and the t statistics upwards making it likely that you will accept as significant variables which in reality are not.

These problems can have several different causes. A strong possibility is that the equation has been incorrectly specified; for example, that there are one or more further explanatory variables which should be added to the regression. In this case the Durbin Watson statistic is 1.71225, which is reasonably satisfactory.

The final two statistics provide information on the accuracy of the algorithm used to calculate the results. In most cases the algorithm will give perfectly satisfactory results, but on occasions when there are many independent variables with considerable differences in the average values the rounding errors introduced in the calculations can cause problems.

This can be detected by the SR or sum of residuals statistic. In most cases it should approximate to zero; indeed when a constant term is included in the regression the approximation should be exact. That it is not equal to zero is due to rounding errors.

In judging how serious these errors are this figure should be compared to ASR, the absolute sum of residuals. The larger is the ratio SR/ASR the more serious the problems of rounding errors are likely to be. It will only be in exceptional cases that this becomes a problem, but when it does corrective action can be taken by appropriate scaling of the variables. Each of the explanatory variables should be divided by its own mean or average value and multiplied by the mean of the dependent variable. The regression equation can then be estimated using these transformed variables.

Linear regression can also be used in forecasting. I have analysed new car registrations, although the same technique can be used for other problems with little or no modification.

The technique first calls for an estimate of an equation which can explain new car registrations for an initial sample period — in this case from the first quarter of 1958 to the second quarter of 1978. You can then use this equation to forecast beyond the sample period.

The equation chosen to fit is an example of an "autoregressive" equation, a type widely used in forecasting work. Part of its charm lies in the simplicity with which it can be set up. If you denote new car registrations in period t by Y_t, then you can write the equation as

$$Y_t = a + bT + cY_{t-1} + dY_{t-2} + eY_{t-3} + fY_{t-4}$$

The term a is again a constant which should be interpreted as before. Y_{t-1} represents new car registrations in the quarter immediately before t, Y_{t-2} new car registrations two periods before t, and so on.

T, the second variable on the right-hand side of the equation is a time tend. It takes the value 1 in the first quarter of the estimation period, 2 in the second and so on. So in the example the time trend takes the value 1 in the first quarter of 1958, 2 in the second quarter until in the second quarter of 1978 it equals 82.

Estimating the equation gives the values shown in table 2. Not all the coefficients are significant, and you may care to experiment with alternative specifications. Try removing some autoregressive Y_{t-1} terms or adding some more.

Forecasting can be done with the help of the simple program in listing 2. Lines 20 to 50 input the four lagged values for car registrations which are necessary to calculate the first prediction. Lines 60 to 90 calculate the predicted values and print the results.

Table 3. Forecasts for new car registration.

Period		actual	forecast
1975	3	102.0	
	4	89.9	
1976	1	100.7	
	2	107.1	
	3	95.5	
	4	115.3	
1977	1	100.5	
	2	99.0	
	3	115.3	
	4	113.6	
1978	1	126.9	
	2	126.2	
	3	139.3	126.5
	4	128.1	129.1
1979	1	131.7	128.6
	2	171.8	128.9
	3	114.8	129.5
	4	140.3	129.6
1980	1	138.8	130.1
	2	112.6	130.7

Data in perspective

The predicted values are shown in table 3, together with the actual figures for the previous 12 quarters to give the predictions some perspective. Overall they are reasonably good. Though some quarters are subject to considerable error, they tend to cancel out. For example, the forecast for the second quarter of 1979 underestimates actual registrations by 42,900, but in the following quarter this boom in car sales was followed, as you might expect, by a temporary slump. The average underprediction throughout the period as a whole was just four percent of total sales. This is reasonably satisfactory, considering that the final forecast was made with data two years old.

The program presented here is a rudimentary one which can easily be embellished in several ways. Most importantly, instead of inputting data directly every time a regression is run the program can be modified to read it from a data file. The data would, of course, have already been entered into this file. In addition it is possible that prior to doing this some variables could be transformed, thus reducing the amount of data that has to be read into the computer.

Thus for the equation for estimating car registrations, for example, having input Y_t it is a simple matter to lag it up to four quarters to create Y_{t-1}, Y_{t-2}, Y_{t-3} and Y_{t-4}. At the same time, both the column of 1s for the constant term and the time trend could be created.

The listing itself hinges around the algorithm to calculate $(X'X)^{-1}X'Y$. X' is the transpose of X: the first row of X becomes the first column of X', the second row of X becomes the second column of X' and so on. This is done in lines 160 to 190 where X' is called Z.

$(X'X)^{-1}$ denotes the inverse of $(X'X)$. This is defined so that $(X'X)(X'X)^{-1} = I$, where I is the identity matrix with 1s on the left-to-right diagonal and 0s everywhere else. This is done between lines 200 and 450 where $(X'X)^{-1}$ is called A.

Lines 470 to 500 calculate $X'Y$ — called P in the listing. Lines 510 to 540 calculate the coefficient vector B, which is equal to AP or $(X'X)^{-1}X'Y$. It is then used in lines 560 to 590 to calculate the vector of predicted values for the dependent variables. The remainder of the program is concerned with calculating the statistical measures which are output with the results.

Linear regression

(continued from previous page)

Two further variables have been added to the basic equation. C_{t-1} is lagged consumption, or consumption in the previous year and is there to reflect the inertia in people's actions. They are used to a certain standard of living, and if their income suddenly falls they do not immediately react to their changed circumstances, but attempt to maintain this standard.

P_t is the rate of inflation. Economists are not yet too sure why this should be in the equation, but in repeated estimations both here and in the United States its importance seems undeniable. To estimate such an equation a computer program is required.

The program in listing 1 was written in basic for a TRS-80 system II level II micro. It was designed to handle up to 15 explanatory variables and 100 observations. More explanatory variables could be handled at the expense of some observations, or vice versa, by changing the values in the Dim statements. Similarly those with smaller computers can pare the program down by reducing the possible number of observations or variables, or both.

Lines 20 to 140 load the data in two stages. First the independent or right-hand side variables are loaded and form an n-by-m matrix X, where n is the number of observations and m the number of variables. When a constant intercept term is included in the regression, as is often the case, a column of 1s is included as part of this matrix.

If you are estimating the equation over 60 time periods, X is a 60 × 4 matrix with the first column consisting of 1s and the second, third and fourth the observations on Y_t, C_{t-1}, and P_t respectively. In this case there are four coefficients to estimate, using the formula

$$\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} = B = (X'X)^{-1}X'Y$$

where Y is a column vector containing data on the dependent variable, X′ denotes the transpose of the matrix X and $(X'X)^{-1}$ the inverse of (X′X).

As an example of the program in use I have estimated the equation for C_t using annual data from 1960 to 1979, a total of 20 observations. The results will appear on the screen or printer, in the form shown in table 1.

The figures under the Coeff heading relate to the coefficients in the equation, which may be written as

$$C_t = 2344.75 + 0.541431Y_t + 0.386002C_{t-1} - 135.355P_t$$

Thus if inflation goes up by one percent spending by consumers will fall by £135 million. The remaining two columns tell you how accurate this and the other coefficients are. You can use the figures under SE or standard error heading to construct confidence intervals or upper and lower estimates for these coefficients.

A rough rule of thumb at the five percent significance level is:

upper limit to the value of the coefficient = Coeff + 2 SE

lower limit to the value of the coefficient = Coeff − 2 SE

In the case of the coefficient on the income variable these limits are

$$.541431 \pm 2 \times .0951742$$

or

$$.7317794 \text{ to } .3510826$$

You can then say that there is only a five percent chance of the true value of the coefficient lying outside these values.

The figures in the fourth column are t statistics. They can be used to determine whether the respective variables can be judged to be a significant factor in determining the dependent variable or not. Again as an approximation, if its absolute value exceeds 2 you can be 95 percent certain that the variable does influence the dependent variable. So in this case only the constant term would have to be rejected as a significant determinant of consumers' expenditure, and you could conclude with only a five percent chance of being wrong in each case, that income, lagged consumers' expenditure and inflation all affect consumers expenditure in the current period.

The figures printed next to the four columns tell you how good the regression as a whole is. RBSQ, the adjusted R^2, tells you the proportion of the variations in the dependent variable which can be explained by the regression equation. If it takes the value 0 then the regression equation is explaining none of the variations in the dependent variable; if it is 1 then it is explaining all of the variations. In this case RBSQ is .993263, so encouragingly more than 99 percent of the variation in consumers' expenditure is explained by this regression.

DW is the Durbin Watson statistic, and ideally should be about 2. As a very rough rule of thumb if it is below 1.2 or above 2.8 then there are likely to be problems with the regression. To begin with there is a strong

Listing 1. The regression program.

```
10 DIM X(100,15),Y(100),N$(15)
20 INPUT "NUMBER OF VARIABLES AND NUMBER OF
   OBSERVATIONS";M,N
30 FOR I= 1 TO M
40 PRINT "INPUT NAME OF INDEPENDENT
   VARIABLE";I
50 INPUT N$(I)
60 FOR J = 1 TO N
70 PRINT "INPUT VARIABLE";I;"OBSERVATION";J
80 INPUT X(J,I)
90 NEXT J:NEXT I
100 INPUT "NAME OF DEPENDENT VARIABLE";N$(M
    +1)
110 FOR J=1 TO N
120 PRINT "INPUT OBSERVATION";J;"ON THE
    DEPENDENT VARIABLE"
130 INPUT Y(J)
140 NEXT J
150 DIM Z(15,100),R(15,100),A(100,15),P(15
    ),B(15),H(100),S(10),G(15),T(15),F(100
    )
160 FOR I= 1 TO M
170 FOR J= 1 TO N
180 Z(I,J)=X(J,I)
190 NEXT J:NEXT I
200 FOR I=1 TO M
210 FOR J=1 TO M
220 FOR K=1 TO N
230 R(J,I)=R(J,I)+Z(J,K)*X(K,I)
240 NEXT K:NEXT J:NEXT I
250 FOR I=1 TO M
260 FOR J=1 TO M
270 A(I,J)=1-ABS(SGN(I-J))
280 NEXT J
290 NEXT I
300 FOR I=1 TO M-1
310 FOR J=I+1 TO M
320 D=R(J,I)/R(I,I)
330 FOR K=1 TO M
340 R(J,K)=R(J,K)-D*R(I,K)
350 A(J,K)=A(J,K)-D*A(I,K)
360 NEXT K
370 NEXT J
380 NEXT I
390 FOR I=M TO 1 STEP -1
400 FOR K=1 TO M
410 FOR J=I+1 TO N
420 A(I,K)=A(I,K)-R(I,J)*A(J,K)
430 NEXT J
440 A(I,K)=A(I,K)/R(I,I)
450 NEXT K:NEXT I
460 REM A=INV(X'X)
470 FOR J=1 TO M
480 FOR K=1 TO N
490 P(J)=P(J)+Z(J,K)*Y(K)
500 NEXT K:NEXT J
510 FOR J=1 TO M
520 FOR K=1 TO M
530 B(J)=B(J)+A(J,K)*P(K)
540 NEXT K
550 NEXT J
560 FOR J=1 TO N
570 FOR I=1 TO M
580 F(J)=B(I)*X(J,I)+F(J)
590 NEXT I
600 H(J)=Y(J)-F(J)
610 S(1)=S(1)+H(J)*H(J)
620 S(2)=S(2)+H(J)
630 S(7)=S(7)+Y(J)
640 NEXT J
650 S(5)=S(1)/(N-M)
660 LPRINT "OLSQ WITH DEPENDENT VARIABLE "
    ;N$(M+1)
670 LPRINT "VAR","COEFF", "S.E.","T STAT"
680 FOR I=1 TO M
690 S(3)=A(I,I)*S(5)
700 G(I)=SQR(S(3))
710 T(I)=B(I)/G(I)
720 LPRINT N$(I),B(I),G(I),T(I)
730 NEXT I
740 FOR I=1 TO N
750 S(8)=S(8)+(Y(I)-(S(7)/N))^2
760 IF I=1 THEN 780
770 S(6)=S(6)+(H(I)-H(I-1))^2
780 NEXT I
790 S(9)=1-(S(1)/S(8))
800 S(4)=S(6)/S(1)
810 LPRINT "ASR=";SQR(S(1))
820 LPRINT "SR="; S(2)
830 LPRINT "DW="; S(4)
840 LPRINT "RBSQ=";1-(1-S(9))*(N-1)/(N-M)
850 INPUT "DO YOU WANT A PLOT OF THE
    RESIDUALS, TYPE 1 FOR YES AND 0 FOR
    NO";A
860 IF A = 0 THEN 910
870 LPRINT "ACTUAL", "PRED","RESIDUAL"
880 FOR I=1 TO N
890 LPRINT Y(I),F(I),H(I)
900 NEXT I
910 END
```

Listing 2. Program used for forecasting.

```
10 DIM X(100)
20 X(82)=126.2
30 X(81)=126.9
40 X(80)=113.6
50 X(79)=115.3
60 FOR J=83 TO 90
70 X(J)=14.4368+0.174438*J+0.[illegible]*X(J-1)
   +0.130049*X(J-2)+0.149864*X(J-3)+
   0.181923*X(J-4)
80 LPRINT X(J)
90 NEXT J
100 END
```

Linear regression

What is it? What principles lie behind it? And what kind of problems can it be applied to? John Hudson discusses what is in fact a useful statistical technique.

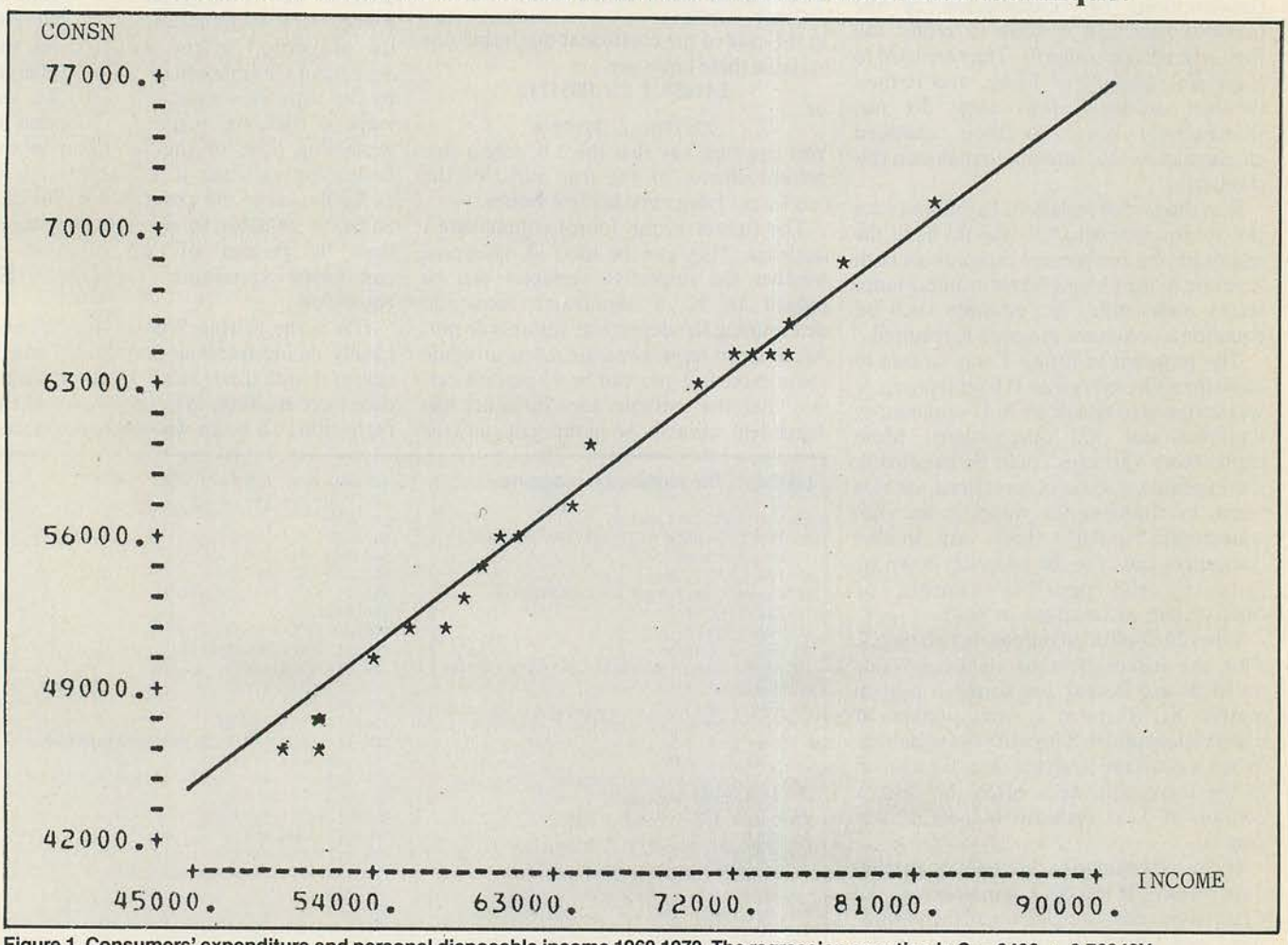


Figure 1. Consumers' expenditure and personal disposable income 1960-1979. The regression equation is $C_t = 8403 + 0.76943Y_t$

MULTIPLE LINEAR REGRESSION is one of the most powerful items in the statistician's toolkit. It has found widespread application in such varied fields as economics, the social sciences and the medical and natural sciences. It is, in fact, the basis of many of the sophisticated statistical software packages in these areas, such as TSP, ESP and BMDP.

First principles

The principles behind regression can best be illustrated by looking at the simplest case, where one variable is being used to explain another variable. Take the case of consumer expenditure — the amount people spend on goods and services. At its simplest you might suppose this to be related to personal disposable income, the amount of money people have left in their pockets after paying income tax and national insurance.

Dr John Hudson is a lecturer in econometrics at the University of Bath.

The equation to be estimated can be written as:

$$C_t = a + bY_t$$

where C_t and Y_t denote aggregate expenditure and disposable income in the economy as a whole, in year t.

Figure 1 shows the relation between these two variables for the years 1960 to 1979, a total of 20 observations. The problem is to fit a line to these observations, that is, to find values for a and b in the equation for C_t. You could, of course, do this by eye, but one person's estimate would give a different line to another person's, and such arbitrariness is obviously unsatisfactory.

The principle behind regression is to fit the line so as to minimise the sum of squared residuals — hence its other name, ordinary least squares or OLSQ. It can be explained by further reference to figure 1, where d_1 represents the distance between the first observation of consumption and income and the fitted line. This is called the residual or error term. Similarly d_2 represents the distance between the second observation and the fitted line, and so on.

The line is chosen so as to minimise the sum of the squared residuals, $d_1^2 + d_2^2 + d_3^2 + \ldots$. There is only one line which will do this for a particular set of observations.

Returning to the equation for C_t you can see that the value of a represents the position where the line cuts the vertical axis; b is the slope of the line, which indicates how much spending will increase for a given increase in income.

So far so good, but you hardly need a computer to estimate such a line; many inexpensive hand calculators have a facility to do the job. It is when there is more than one explanatory variable on the right-hand side of the equation, that the problem becomes more difficult.

For example, you might wish to estimate a slightly more sophisticated version of the equation

$$C_t = a + bY_t + cC_{t-1} + dP_t$$

(continued on next page)

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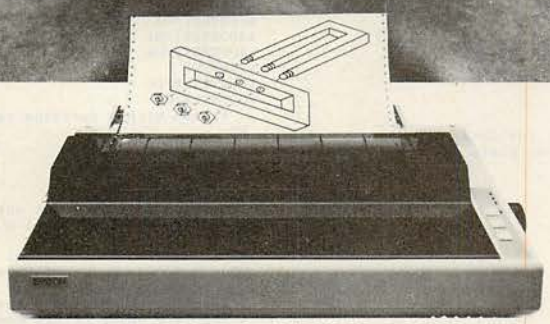

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20th April 1982

Mr R Maughan
Adda Computers Ltd.
154 Victoria Road
Acton
LONDON W3
England

Dear Mr. Maughan,

FORM-LETTER PROGRAMS

I have pleasure in sending a demonstation copy of my form-letter programs for use in conjunction with the "Wordstar" and "Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a large number of addressees, with a minimum of effort. The programs consist of a CBASIC program called FORMLET.BAS, three Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two demonstration files.

If you would like more information, please contact me at the above address, and I will be glad to be of assistance.

Yours sincerely,

David R. Green

DRG/occ

20th April 1982

Computer Interfacing and Equipment Ltd.
The Mico-spares shop
19 Roseburn Terrace
Edinburgh
EH12 5NG
England

Dear Sir,

FORM-LETTER PROGRAMS

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Yours sincerely,

David R. Green

DRG/occ

Suite of three command files.

```
.. FILENAME LET.CMD
.. Sets up the variable heading of the letter
..
.. Repeats until the data is used up
.RP
..
.. Record No. and 8 data items expected
.. Print on screen
..
.RV RECNO,NAME,COMPANY,ADDRESS1,ADDRESS2,TOWN,POSTCODE,COUNTRY,TITLE
.CS RECORD No. &RECNO&
.DM Name        &NAME&
.DM Company     &COMPANY&
.DM Address 1   &ADDRESS1&
.DM Address 2   &ADDRESS2&
.DM Town        &TOWN&
.DM Postcode    &POSTCODE&
.DM Country     &COUNTRY&
..
.. The ^C is a control character entered using the
.. ^P menu, and halts printing until P is pressed
.. on the keyboard
..
.. Print letter
.. If you are not using letterhead paper, you could
.. make a letterhead below to be printed on plain
.. paper
..
&DATE&


&NAME/O&
&COMPANY/O&
&ADDRESS1/O&
&ADDRESS2/O&
&TOWN/O&
&POSTCODE/O&
&COUNTRY/O&

Dear &TITLE&,

..
..  Includes the text of the letter here on your file
..
.FI &TEXTFILE&
..
..  Finish with a carriage return after PA
.PA



..FILENAME ENV.CMD
..Prints addresses on envelopes from a data file
..
.. Repeat until data finished
..
.RP
..
.. Page offset 40 columns Page length 20 lines
..   - modify to suit size of envelopes
..
.PO40
.PL20
..
.. Record-number & 8 variables are expected in the data
.. Print out on screen first
..
.RV RECNO,NAME,COMPANY,ADDRESS1,ADDRESS2,TOWN,POSTCODE,COUNTRY,TITLE
.CS RECORD No. &RECNO&
.DM Name        &NAME&
.DM Company     &COMPANY&
.DM Address 1   &ADDRESS1&
.DM Address 2   &ADDRESS2&
.DM Town        &TOWN&
.DM Postcode    &POSTCODE&
.DM Country     &COUNTRY&
..
..  Now print envelope.  /O ignores blank fields
..  N.B. letter O not number zero
..  ^C halts printing until P is pressed on keyboard
..
&NAME/O&
&COMPANY/O&
&ADDRESS1/O&
&ADDRESS2/O&
&TOWN/O&
&POSTCODE/O&
&COUNTRY/O&
.. finish with a carriage return
.PA


.. FILENAME  FORM.CMD
.. Command file to print out form letters and
.. address envelopes from a data file
..
.MT0                    set top margin to zero
.OP                     turn off page no.
..
.. The file which prints the letter heading is LET.CMD
.. The file which prints envelopes is ENV.CMD
.. if you wish to modify, alter these lines
..
.SV ENVFILE,B:ENV.CMD
.SV LETFILE,B:LET.CMD
..
..  Input variables from console
..
.CS
.DM                FORM LETTER VERSION 1.0
.DM
.AV" What is the filename of the text? ",TEXTFILE,14
.DM
.AV" What is the filename of the addresses? ",ADDFILE,14
.DM
.AV" What is the date? ",DATE
..
..  Define data file and print letters
..
.DF &ADDFILE&
.CS
.DM          READY TO PRINT LETTERS
.FI &LETFILE&
..
..  Define data file and print envelopes
..
.DF &ADDFILE&
.CS
.DM          READY TO PRINT ENVELOPES
.FI &ENVFILE&
.CS          FORM LETTER 1.0 FINISHED
```

WordStar

(continued from previous page)

CBasic features

The programs were written in CBasic because of its easier file because of its easier file handling, but it should be possible to convert to Microsoft MBasic. The following features of CBasic may be unfamiliar:

CBasic only requires line numbers when a line is referenced in a Goto, Gosub, etc. Use the sequential line numbers in MBasic and change references to them in the main text.

Backslash is used to continue on a new line. MBasic uses form-feed without a carriage-return.

C$, U$ and F$ are defined for the Osborne 1; you will have to redefine for your system. If U$ and F$ are undefined, no harm will befall most systems.

The Match (A$,B$,N) function finds the position as an integer of the first occurrence of A$ within B$, starting at position N. If no match is found then 0 is returned; it is similar to MBasic's Instr function. The operator £ matches any number and ! matches any letter.

UCase$ is a function which converts a string to upper case.

The File command creates a new file if one does not exist, and opens it for reading or writing sequentially. It will need to be recoded in MBasic, as opening an existing file in Write mode destroys its contents. The MBasic manual outlines the procedure to follow in the section on disc I/O.

If End £1 Then 100 is similar to If EOf (1) Then 100, but appears in a different place. The latter should appear inside the loop reading the file — see MBasic manual.

Size (A$) measures the size in blocks of the file name A$.

LPrinter and Console switch subsequent output to the line printer and screen respectively. The Width command sets the width of the printer according to your system.

Delete and Rename delete and rename disc files.

Input-Line is equivalent to Line Input.

the computer works

microcomputer consultancy

p.o. box 50973
nairobi
kenya
phone:

20th April 1982

The Editor
Practical Computing
IPC Electrical Electronic Press Ltd.
Quadrant House, The Quadrant
SUTTON, Surrey
SM2 5AS
England

Dear Mr. Laurie,

FORM-LETTER PROGRAMS

I have pleasure in sending a demonstation copy of my form-letter programs for use in conjunction with the "Wordstar" and "Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a large number of addressees, with a minimum of effort. The programs consist of a CBASIC program called FORMLET.BAS, three Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two demonstration files.

If you would like more information, please contact me at the above address, and I will be glad to be of assistance.

Yours sincerely,

David R. Green

DRG/occ

Sample output of program suite.

Demo.Let sample listing.

```
..
.. This is a demonstration text for a form letter
..

                    FORM-LETTER PROGRAMS

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programs for use in conjunction with the "Wordstar" and
"Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a
large number of addressees, with a minimum of effort.  The
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Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two
demonstration files.

If you would like more information, please contact me at the
above address, and I will be glad to be of assistance.

Yours sincerely,



David R. Green


..        End the file with a carriage return!
..
DRG/occ
```

Demo.Adr sample listing.

```
1,"D. R. Green","The Computer Works","P.O. Box 50973","","Nairobi","","Kenya","David"
2,"Mr R Maughan","Adda Computers Ltd.","154 Victoria Road","Acton","LONDON W3","","England","Mr. Maughan"
3,"","Computer Interfacing and Equipment Ltd.","The Mico-spares shop","19 Roseburn Terrace","Edinburgh","EH12 5NG","England","Sir"
4,"The Editor","Practical Computing","IPC Electrical Electronic Press Ltd.","Quadrant House, The Quadrant","SUTTON, Surrey","SM2 5
AS","England","Mr. Laurie"
```

WordStar

For his direct-mail operation David Green chose an Osborne, but anyone can use his suite of programs to develop their own mailing-list facility.

compiled to Formlet.Int. To run, type

A:CRUN2 B:FORMLET

The program is menu driven, and allows you make a new file, add new items to an existing file, amend or delete individual records, list the file, and return to CP/M. Options M and A are really the same, except that an error message warns that you may be doing the wrong thing if you use the wrong one unintentionally. Option E allows you to review each record, and Accept, A; Change, C; Delete, D; or Exit, X to return to the menu.

When replying to the request for a file name and when entering address data in all the options, a single backslash followed by Return will enter the same value as previously entered to that question. This is particularly useful when entering many addresses from the same town or county, and in changing records when only one field is in error.

The maximum number of characters in any field is 255. The data is stored sequentially in the file with a record number and eight fields. The names are arbitrary, and of course more fields could be added provided all references to it are changed in the program and in the command files.

Partial amendments

When the file is edited using the E option the whole file is copied together with any amendments, as it is sequential. The copy is given a CP/M file type of $$$ and renamed at the end of processing with the original name after the old version is deleted. You must check that there is sufficient space left on the disc to make the temporary file, or a run-time error will be produced. If this occurs, the original file will be intact.

Once all the necessary files are present on disc B, load WordStar in drive A and ask for option M at the no file menu. The file to Mergeprint is B.Form.Cmd. The questions may all be answered by default, or avoided by entering the file name with Esc instead of Return. The computer will then ask you for the names of the text and data files and the date of the letters.

Insert the first sheet of letterhead paper in the printer, and the screen will display the address of the first letter to be printed. Press the space bar, followed by P and the first letter is printed out; repeating the procedure will print every letter.

You are then warned to insert the envelopes for addressing. The program will halt in the same way between envelopes, but if you use continuous stationery remove every C from the Cmd files. The printing may be aborted at any time using P unless WordStar is waiting for a P to restart, in which case two in quick succession are needed to stop.

(continued on next page)

```
150: 1600   PRINT C$
151:        PRINT TAB(5);U$;"PROCESSING FILE ";FILENAME$;" COMPLETED";F$
152:
153:        DELETE 1
154:
155:        CLOSE 2
156:
157:        DUMMY% = RENAME(FILENAME$,TEMP$)
158:
159:        RETURN   REM TO MENU
160:
161:
162:        REM ********    EXIT TO CPM   ********
163:
164: 1700           STOP
165:        REM NO RETURN HERE
166:
167:
168:        REM ********  PRINT OUT FILE  ********
169:
170: 1800   GOSUB 2700       REM INPUT FILENAME
171:
172:        IF SIZE% = 0 THEN PRINT :\
173:        PRINT U$;"THIS FILE DOES NOT EXIST";F$ :\
174:        PRINT : INPUT "Press Return to restart";LINE A$ :\
175:        RETURN          REM TO MENU
176:
177:        FILE FILENAME$          REM OPEN FILE
178:        IF END #1 THEN 2000
179:
180:        PRINT
181:        PRINT TAB(5);U$;"READY THE PRINTER AND PRESS RETURN";F$
182:        INPUT "";LINE A$
183:
184:        LPRINTER WIDTH 80
185:        C$ = ""        REM KILL SCREEN CLEAR
186:
187: 1900           READ #1;RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
188:                        TOWN$,POSTCODE$,COUNTRY$,TITLE$
189:
190:                GOSUB 2300            REM PRINT
191:                PRINT
192:
193:                GOTO 1900
194:
195: 2000   C$ = CLS$
196:        CLOSE 1
197:        CONSOLE
198:
199:        RETURN   REM TO MENU
200:
201:
202:        REM *******  SUBROUTINES  *********
203:
204: 2100   IF SIZE% = 0 THEN RETURN
205:
206:        PRINT C$;TAB(5);U$;"WARNING THIS FILE EXISTS ALREADY";F$
207:        PRINT
208:        PRINT
209:        INPUT"  Do you wish to add to it? (Y/N)";LINE A$
210:
211:        RETURN
212:
213: 2200   IF SIZE% > 0 THEN RETURN
214:
215:        PRINT C$;TAB(5);U$;"WARNING THIS FILE DOES NOT EXIST";F$
216:        PRINT
217:        PRINT
218:        INPUT"  Do you wish to create one? (Y/N)";LINE A$
219:
220:        RETURN
221:
222:
223:        REM PRINT OUT CURRENT RECORD
224:
225: 2300   PRINT C$
```

```
226:        PRINT TAB(5);U$;"RECORD No.";RECORD.NO%;F$
227:        PRINT
228:        PRINT "  Name        "; NAME$
229:        PRINT "  Company     "; COMPANY$
230:        PRINT "  Address 1   "; ADDRESS1$
231:        PRINT "  Address 2   "; ADDRESS2$
232:        PRINT "  Town        "; TOWN$
233:        PRINT "  Postcode    "; POSTCODE$
234:        PRINT "  Country     "; COUNTRY$
235:        PRINT "  Title       "; TITLE$
236:
237:        RETURN
238:
239:        REM INPUT NEW DATA
240:
241: 2400   PRINT C$
242:        PRINT TAB(5);U$;"RECORD No.";RECORD.NO%;F$
243: 2500   PRINT
244:        INPUT "  Name        "; LINE A$
245:        IF A$ <> "\" THEN NAME$ = A$
246:        INPUT "  Company     "; LINE A$
247:        IF A$ <> "\" THEN COMPANY$ = A$
248:        INPUT "  Address 1   "; LINE A$
249:        IF A$ <> "\" THEN ADDRESS1$ = A$
250:        INPUT "  Address 2   "; LINE A$
251:        IF A$ <> "\" THEN ADDRESS2$ = A$
252:        INPUT "  Town        "; LINE A$
253:        IF A$ <> "\" THEN TOWN$ = A$
254:        INPUT "  Postcode    "; LINE A$
255:        IF A$ <> "\" THEN POSTCODE$ = A$
256:        INPUT "  Country     "; LINE A$
257:        IF A$ <> "\" THEN COUNTRY$ = A$
258:        INPUT "  Title       "; LINE A$
259:        IF A$ <> "\" THEN TITLE$ = A$
260:        RETURN
261:
262:        REM MAKE TEMPORARY FILENAME
263:
264: 2600   POINT% = MATCH(".",FILENAME$,1)
265:
266:        IF POINT% = 0 THEN TEMP$ = FILENAME$ + ".$$$"\
267:        ELSE TEMP$ = LEFT$(FILENAME$,POINT%) + "$$$"
268:
269:        RETURN
270:
271:        REM  INPUT FILENAME AND CHECK LEGAL
272:
273: 2700   PRINT C$
274:        INPUT "  What is the filename";LINE A$
275:        IF A$ <> "\" THEN FILENAME$ = UCASE$(A$)
276:
277:        IF FILENAME$ = "" THEN PRINT :\
278:        PRINT TAB(5);U$;"ENTER FILENAME IN FULL";F$ :\
279:        FOR I% = 1 TO 1000 : NEXT : GOTO 2700
280:
281:        ERROR% = 0
282:        FOR I% = 1 TO LEN(FILENAME$)
283:        A$ = MID$(FILENAME$,I%,1)
284:        X% = MATCH("E",A$,1) + MATCH("!",A$,1) \
285:                + MATCH(".",A$,1) + MATCH(":",A$,1)
286:        IF X% = 0 THEN ERROR% = 1
287:        NEXT
288:
289:        IF ERROR% = 1 THEN PRINT :\
290:        PRINT TAB(5);U$;"BAD FILENAME:  RE-ENTER";F$ :\
291:        FOR I% = 1 TO 1000 : NEXT : GOTO 2700
292:
293:        SIZE% = SIZE(FILENAME$)
294:        RETURN
295:
296:        END
NO ERRORS DETECTED
CONSTANT AREA:      8
CODE SIZE:       2439
DATA STMT AREA:     0
VARIABLE AREA:    208
```

Form letters on

WORDSTAR IS one of those programs which you either love or hate. After the initial shock at the size of the manual I discovered that this was the word-processing program for me.

My WordStar came with an Osborne 1 computer which I had bought to use in direct-mail applications. When I came to examine the manual I found that it did not include any listings of exactly what I wanted so I wrote an extra suite of programs to tailor the package to my needs.

A form-letter system enables you to send the same letter to a large number of addressees taken from a file of names and addresses. Many packages — including the American Postmaster and NAD which I have used in the past — are of limited use since they cannot cope easily with long, unusual or overseas addresses. The Formlet system solves this problem by using sequential files for the names and addresses. It also addresses envelopes but dispenses with the extraction and sorting of records, which I do not find necessary.

The suite of programs consists of three command files Form.Cmd, Let.Cmd and Env.Cmd. which will normally be on drive B. The user will provide two additional files, the first with the text of the letter and the second a data file containing the addresses and other information.

Demonstration

The first file is entered in the normal way using WordStar, but the data file is best entered and maintained using a CBasic program Formlet.Bas. Demonstration listings Demo.Let. and Demo.Adr are included as an example of what is required to complete the suite.

The command files contain Dot commands to the printing routines inside Mailmerge. They are explained in more detail in the WordStar manual, but I have added comments using two dots to clarify them. These comments may be omitted, if you wish, when you copy the listing.

Small data files can be entered directly using WordStar's N command. It is difficult to do this accurately, and I would recomend using the CBasic program listed here to enter, change and delete records.

To use the program, type in the listing, using WordStar's N command and the file name

B:FORMLET.BAS

Do not type in the sequential line numbers in the left-hand margin, which are supplied by CBasic during compilation, only those in increments of 100 which are used as labels.

When you have finished, put CBasic in drive A and your program in drive B. Type

A:CBAS2 B:FORMLET

and the program Formlet.Bas will be

Formlet.Bas program, used for maintaining data files.

```
ASM V2.03  COMPILATION OF E:FORMLET

  1:        REM             FORMLET.BAS  VER 1.0
  2:        REM             OSBORNE 1   CBASIC
  3:
  4:        REM             A PROGRAM TO MAKE
  5:        REM             AND MAINTAIN FILES OF
  6:        REM             NAMES AND ADDRESSES
  7:        REM             FOR FORM.CMD VER 1.0
  8:        REM
  9:        REM             C D.R.GREEN 1982
 10:
 11:        REM  ***********************************
 12:        REM  THIS CODE IS SYSTEM SPECIFIC AND MAY
 13:        REM  NEED TO BE CHANGED FOR OTHER SYSTEMS
 14:
 15:        CLS$ = CHR$(26)          REM CLEAR SCREEN
 16:        US = CHR$(27)+"I"        REM UNDERLINE ON
 17:        FS = CHR$(27)+"m"        REM UNDERLINE OFF
 18:
 19:        REM     END OF SYSTEM SPECIFIC CODE
 20:        REM  ***********************************
 21:
 22:                        C$ = CLS$
 23:
 24:
 25:        REM                     MENU
 26: 100    PRINT C$
 27:        PRINT TAB(12);U$;"FORM-LETTER VERSION 1.0";F$
 28:        PRINT
 29:        PRINT
 30:        PRINT TAB(20);U$;"MENU";F$
 31:        PRINT
 32:        PRINT
 33:        PRINT "  M.  Make a new address file."
 34:        PRINT "  A.  Add records to an existing file."
 35:        PRINT "  E.  Edit records in an existing file."
 36:        PRINT "  P.  Print out formatted listing of file."
 37:        PRINT "  X.  Exit to CP/M."
 38:        PRINT
 39:        PRINT
 40:        PRINT TAB(8);U$;"ENTER M,A,E,P or X TO CONTINUE";F$
 41:        PRINT
 42:        PRINT
 43:        INPUT "    "; LINE A$
 44:
 45:
 46:        MENU% = MATCH(UCASE$(A$),"MAEXP",1)
 47:        IF MENU% = 0 THEN 100  REM REPEAT MENU
 48:
 49:        ON MENU% GOSUB 200,200,1000,1700,1800
 50:
 51:        GOTO 100                        REM MENU
 52:
 53:
 54:
 55:        REM  ********  ENTRY ROUTINE  ********
 56:
 57: 200    GOSUB 2700          REM INPUT FILENAME
 58:        A$ = "Y"
 59:        ON MENU% GOSUB 2100,2200  REM TEST IF FILE EXISTS
 60:        IF UCASE$(A$) = "Y" THEN 300
 61:
 62:        RETURN    REM TO MENU IF WRONG OPTION
 63:
 64: 300    FILE FILENAME$      REM OPEN THE FILE
 65:
 66:
 67:        RECORD.NO% = 1
 68:        IF END #1 THEN 500
 69:
 70: 400            READ #1;DUMMY%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
 71:                        TOWN$,POSTCODE$,COUNTRY$,TITLE$
 72:
 73:                RECORD.NO% = RECORD.NO% + 1
 74:                GO TO 400          REM GET TO END OF FILE
 75:
 76: 500            GOSUB 2400         REM INPUT DATA
 77: 600            GOSUB 2300         REM PRINT OUT RECORD
 78:
 79:                PRINT
 80:                INPUT"  Is this correct? (Y/N)";LINE A$
 81:                IF UCASE$(A$) = "Y" THEN 700
 82:
 83:                GOSUB 2500 : GOTO 600  REM PRINT OUT AGAIN
 84:
 85: 700            PRINT #1;RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
 86:                        TOWN$,POSTCODE$,COUNTRY$,TITLE$
 87:                PRINT
 88:                PRINT
 89:                INPUT"  Do you wish to continue? (Y/N)";LINE A$
 90:                IF UCASE$(A$) = "Y" THEN GOTO 800 \
 91:                        ELSE GOTO 900
 92:
 93:
 94: 800            RECORD.NO% = RECORD.NO% + 1
 95:
 96:                GO TO 500     REM INPUT NEXT RECORD
 97:
 98: 900    CLOSE 1          REM GET HERE WHEN FINISHED
 99:
100:        RETURN     REM TO MENU
101:
102:
103:
104:        REM  *******  AMMENDMENT ROUTINE  *******
105:
106: 1000   GOSUB 2700        REM INPUT FILENAME
107:        FLAG% = 0
108:        IF SIZE% = 0 THEN PRINT :\
109:        PRINT US;"THIS FILE DOES NOT EXIST";F$ :\
110:        PRINT : INPUT "Press Return to restart";LINE A$ :\
111:        RETURN            REM TO MENU
112:
113:        GOSUB 2600        REM MAKE TEMPORY FILENAME
114:        PRINT
115:        INPUT "  Start at record number?";LINE A$
116:        REC% = VAL(A$)
117:
118:        FILE FILENAME$            REM #1   OLD FILE
119:        FILE TEMP$                REM #2   NEW FILE
120:        IF END #1 THEN 1600
121:        NEW.RECORD.NO% = 0
122:
123: 1100       READ #1;RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
124:                    TOWN$,POSTCODE$,COUNTRY$,TITLE$
125:
126:            IF FLAG% = 1 THEN 1500
127:            IF RECORD.NO% < REC% THEN 1500
128:
129: 1200       GOSUB 2300       REM PRINT ON SCREEN
130:
131:            PRINT
132:            INPUT"  Accept? (A), Change? (C), Delete? (D), eXit? (X)"; \
133:                LINE A$
134:
135:            A$ = UCASE$(A$)
136:            ON MATCH(A$,"ACDX",1)+1 GOTO 1200,1500,1300,1100,1400
137:
138: 1300       GOSUB 2500                REM CHANGE
139:            GOTO 1200
140:
141: 1400       FLAG% = 1                 REM EXIT
142:
143: 1500       NEW.RECORD.NO% = NEW.RECORD.NO% + 1
144:
145:            PRINT #2;NEW.RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
146:                    TOWN$,POSTCODE$,COUNTRY$,TITLE$
147:
148:            GOTO 1100
149:
```

Spelling	Training	Comment	Source
no	no	straightforward beginner's WP	Molimerx
no	no	needs Sup'R'term 80-column card	all Apple dealers
no	yes	powerful stored-command featue	most Apple dealers
no	yes	powerful stored-command feature	Intelligence, Microtechnology
no	yes	multi-user version £750	MPSL
no	yes	uses colour, for example when moving block	NEC
no	no	40-column WP for unexpanded Apple	Pete & Pam
no	yes	matching list and spelling programs	EOS
no	yes	cassette version £60	Microcomputer Applications
no	yes	works with most 80-column cards	Personal Computers Ltd
yes	yes	90,000-word U.S. speller, index-building	IBR
no	yes	APL founts, plotter-driving version £295	APL
no	no	80 cols with Videx or Sup'R'term, 40 without	Pete & Pam
no	no	£110 disc or £150 ROM version	Silica Shop
no	yes	index compiling, table of contents	Microtrend
no	yes	has 40 memories for margins, numbers, commands, etc.	Intelligence (IRL)
no	yes	links to other Adds packages	Adds
yes	yes	foreign dictionaries available for speller	Compucorp
no	yes	available for most 16-bit machines	Peachtree
no	no	includes form-design package	Moffat Rose
no	no	gives 70 columns without add-on card	SBD, Pete & Pam
no	yes	links to other Systematics International packages	SI
yes	yes	multiple founts with some printers; sort	Encotel
no	no	40-column WP for unexpanded Apple	Pete & Pam
no	yes	file compatible with Silicon Office	Precision
yes	no	powerful mailing list and form letter	Pete & Pam
no	yes	available for wide range of machines	Tabs
yes	yes	multi-user WP with electronic mail	Redwood
no	no	comes on ROM, uses cassette or disc files	Acornsoft
no	no	cassette version £40	Kuma
no	no	gives Apple 66 columns without card	Pete & Pam
no	yes	can use VisiCalc data, maths add-on	Dataview
add	yes	best-selling CP/M word processor	most CP/M dealers, Micropro
no	yes	requires COS at £260	Interface Microsystems
yes	yes	built-in 25,000 word U.K. spellings	Graffcom

	Price	Manufacturer	Machine or operating system	List processing	Math
Ajedit	£43	Molimerx	TRS-80 I or Genie	yes	no
Apple Writer II	£89	Apple	Apple II	yes	no
Apple Writer III	£133	Apple	Apple III	yes	no
ATP-80	£260	Redwood	CP/M	yes	yes
Autowriter	£400	MPSL	BOS	yes	no
Benchmark	£232	Metasoft	NEC PC-8000	yes	yes
Easywriter 40	£50	Information Unlimited	Apple II	yes	no
Easywriter II	£235	Information Unlimited	IBM PC-DOS	no	no
Electric Pencil	£70	IJG	TRS-80 I or III, Genie	yes	no
Format-80	£199	Elite Software	Apple II	no	yes
For:Word	£380	Fortune Systems	Fortune 32:16	yes	yes
Jot	£95	Alan Pearman Ltd	CP/M-86, MS-DOS	yes	yes
Letter Perfect	£99	LJK Enterprises	Apple II	no	no
Letter Perfect		LJK Enterprises	Atari	no	no
Lexicom	£350	Microtrend	CP/M	yes	yes
Microscript	£275	Intelligence (IRL)	CP/M, MP/M		yes
MVword	£500	Adds	Multivision	yes	no
Omega B	£700	Compucorp	Compucorp 600	yes	yes
Peachtext	£250	Peachtree	CP/M, CP/M-86	yes	no
Rosewood I	£350	Moffat Rose	CP/M	yes	yes
Screenwriter II	£75	Sierra Online	Apple II	yes	no
SI Word processing	£175	Systematics International	UCSD P-System	yes	no
Spellbinder	£289	Lexisoft	CP/M, Oasis, Exidy	yes	yes
Super Text II	£85	Muse	Apple II	no	yes
Superscript	£249	Precision	Commodore	yes	no
Superwriter	£249	Sorcim	CP/M-80, MS-DOS	yes	no
Tabwriter	£125	Tabs	Apple II, CP/M, MS-DOS	yes	no
Uniplex	£450	Redwood	Unix with compiled C	yes	no
View	£52	Acornsoft	BBC model A or B	no	no
Wdpro	£80	Kuma	Sharp MZ-80A, B and K	no	no
Word Handler	£109	Silicon Valley	Apple II	yes	no
Wordcraft	£425	Dataview	Commodore	yes	no
WordStar	£250	Micropro	CP/M, CP/M-86, MS-DOS	yes	no
WP System	£200	ML Systems	CP/M with COS	no	no
WP-2020	£290	Graffcom	CP/M	yes	no

WP packages

OVER THE PAGE is a table listing some of the main word-processing packages and their special features. They will all do the basic WP tasks, as described on page 95.

The table does not claim to be comprehensive. Practically every micro has its own special or recommended WP package, but these are only really of interest to owners of the particular machine. We have tried to list the newer and the more interesting packages, but the fact that a package has not been listed does not imply that it is not useful or interesting.

Special features

List Processing. The ability to place into a standard document details taken from a separate list — for instance placing names and addresses into a form letter to generate a whole number of personalised letters.

Maths Facilities. Offered by some WP packages, allowing numbers to be placed neatly in columns and permitting limited arithmetic processing.

Spelling Checkers. Built in as standard in a few packages; dubious spelling is detected and either displayed for the user's approval or, on request, altered to whatever seems plausible to the software. The Spelling-Checker table covers separate stand-alone spelling packages. They will generally work with any word processor which uses the standard file type of the machine in question, although it as well to check before purchasing.

Dictionary size. The number of pre-defined words the package will recognise.

Suppliers

Adds U.K. Ltd, 137-141 High Street, New Malden, Surrey KT3 4BH. Telephone: 01-949 1272.

Alan Pearman Ltd, Maple House, Mortlake Crescent, Chester CH3 5UR. Telephone: (0244) 46024.

Apple Computer (U.K.) Ltd, Finway Road, Hemel Hempstead, Hertfordshire HP2 7PS. Telephone: (0442) 48151

Acornsoft Ltd, 4A Market Hill, Cambridge CB2 3NJ. Telephone: (0223) 316039

Cambrian Software, Gwynllys, Croeslon, Caernarfon, Gwynedd LL54 7ST. Telephone: Llanwnda (0286) 831072

Commodore U.K., 675 Ajax Avenue, Trading Estate, Slough, Berkshire. Telephone: 01-997 6666

Compucorp Ltd, Cunningham House, Westfield Lane, Kenton, Middlesex. Telephone: 01-907 0198

Dataview, Radix House, East Street, Colchester, Essex C01 2XB. Telephone: (0206) 869414

Encotel Systems, 7 Imperial Way, Croydon, Surrey CRO 4RR. Telephone: 01-680 6040

EOS Electronic Office Services, 235-241 Blackfriars Road, London SE1 8NN. Telephone: 01-928 3377

Graffcom Systems Ltd, 102 Portland Road, London W11 4LX. Telephone: 01-385 9422

Intelligence (Ireland) Ltd, Nagor House, Dundrum Road, Windy Arbour, Dublin 14. Telephone: Dublin 788555

Interface Microsystems, 57 High Street, Gread Baddow, Chelmsford, Essex CM2 7HJ. Telephone: (0245) 76766

IBR Microcomputers, Unit 57, Suttons Industrial Park, London Road, Earley, Reading, Berkshire. Telephone: (0734) 664111

Kuma Computers, 11 York Road, Maidenhead, Berkshire. Telephone: (0628) 71778

Microtechnology, 51 The Pantiles, Tunbridge Wells, Kent. Telephone: (0892) 45433

Molimerx Ltd, 1 Buckhurst Road, Bexhill-on-Sea, East Sussex. Telephone: (0424) 223636

MPSL Microproducts Software Ltd, 87-89 Saffron Hill, London EC1N 8QU. Telephone: 01-831 8811

Microtrend, PO Box 51, Pately Bridge, Harrogate, North Yorkshire HG3 5DF. Telephone: (0423) 711878

Moffat Rose Ltd, 16-26 New Oxford Street, London WC1A 1EH. Telephone: 01-405 3400

Microcomputer Applications, 41 Queen's Road, Blandford Forum, Dorset DT11 7LA. Telephone: (0258) 55100

Micropro International, 31 Dover Street, London W1

NEC Business Systems (Europe) Ltd, 164-166 Drummond Street, London NW1 3HP. Telephone: 01-388 6100

Pete & Pam Computers, New Hall Hey Road, Rossendale, Lancashire BB4 6JG. Telephone: (0706) 22011

Peachtree Software International Ltd, 43-53 Moorbridge Road, Maidenhead, Berkshire SL6 8LT. Telephone: (0628) 32711

Personal Computers Ltd, 220-226 Bishopsgate, London EC2A 4JS. Telephone: 01-377 1200

Precision Software Ltd, 4 Park Terrace, Worcester Park, Surrey KT4 7JZ. Telephone: 01-330 7166

Redwood Bureau Services, 2 High Street, St Albans, Hertfordshire AL3 4EH. Telephone: (0727) 38138

SBD Software, 15 Jocelyn Road, Richmond, Surrey TW9 2TJ. Telephone: 01-948 0461

Silica Shop, 1-4 The Mews, Hatherley Road, Sidcup, Kent. Telephone: 01-301 1111

Systematics International Microsystems Ltd, Cleves House, Hamlet Road, Haverhill, Suffolk. Telephone: (0440) 61121

Tabs Ltd, Sopers House, Chantry Way, Andover, Hampshire SP10 1LU. Telephone: (0264) 58933

Wisbech Computer Services Ltd, 10 Market Street, Wisbech, Cambridge PE13 1EX. Telephone: (0945) 64146

Spelling checkers

	Price	Manufacturer	Origin	Runs on	Dictionary size	American spelling	U.K. spelling	Source
Dictionary	£65	Sierra Online	U.S.	Apple II Dos 3.3	28,000	yes	no	SBD, EOS, Pete & Pam
Easyspeller	£125	Information Unlimited	U.S.	MS-DOS, CP/M-86	90,000	yes	no	Pete & Pam
Hexspell	£52	Hexagon	Canada	Tandy I, Genie I & II	30,000	yes	yes	Molimerx
Proof	£120	Cambrian	U.K.	Apple II Dos 3.3	45,000	yes	yes	Cambrian
Red Pencil	£60	IJG	U.S.	TRS-80 I, III, Genie	50,000	yes	no	Micro Applics
Spellcheck	£200	Lexisoft	U.S.	CP/M, Oasis, Exidy	10,000	yes	no	Encotel
Spelling Proofreader	£100	Peachtree	U.S.	CP/M, CP/M-86	20,000	no	yes	Peachtree
Spellguard	£179	Sorcim	U.S.	CP/M	23,000	no	yes	Microtrend
Spellstar	£120	Micropro	U.S.	CP/M	20,000	yes	no	Micropro

(continued from previous page)
to transfer Perfect Writer and my text files across to it. Since then, as they say in the ads, I have used no other.

Why? You may well ask, if the package is so off-putting initially. The answer lies largely in the speed of the new computer. Experience is already showing that the advent of low-cost Winchester disc technology far outweighs in practical importance the much-advertised arrival of 16-bit machines. Perfect Writer exemplifies this rather well.

The "feel" of Perfect Writer is far more organic than other word processors I have used. The cursor moves in natural text units; not just by line or column in the ordinary way, but also by word, both forwards and backwards. So, you may say, does the WordStar cursor, but Perfect Writer goes further. You can skip through the text sentence by sentence or paragraph by paragraph in either direction. That may not sound particularly impressive, but when you are engaged in heavy revision of long texts you gratefully discover you can get the cursor to where you need it just about as fast as you can think.

Step forward

This alone would be worth the price of admission, but there is more. You can delete by those same text units: by word, by sentence and by paragraph. The responsiveness of being able to put the cursor anywhere inside a paragraph and just hit Control-H Control-W to remove it makes you realise what a chore it used to be to have to set markers fore and aft as a prelude to every Block Delete, Move or Copy operation.

What happens when you want to operate on sections of text that are bigger or smaller than the basic units? Here you will need markers, but the process is simple. Position the cursor at one end of the block and hit <Esc> <Spacebar>. A flag comes up on the bottom line saying Marker Set. Now position the cursor at the end of the block. Hit Control-W and the block has gone.

Compare this with WordStar, where you have to set a pair of markers explicitly, <B> at the beginning of the block and <K> at the end. And you'd better make sure they are the right way round or WordStar objects.

In the Emacs lifestyle there is no essential difference between deleting text or moving it. Every time you make a deletion that is larger than a single character the text is stored in an invisible buffer called the Kill Buffer, until the time of the next deletion. This has two advantages: careless deletion can be repaired instantly, and moving text is simply a matter of repositioning the cursor and hitting Control-Y.

Once you are used to this you can induce the kill Buffer to accumulate chunks of text by inserting <Esc> Control-W before you make each deletion. Provided you know what you are doing you can use this technique to mount a very fast cut-and-paste operation; for example, zipping though a large text to gather together the bones of a synopsis.

This accumulation will not be visible until you yank it back with the Control-Y command. If you prefer to see the assembly in progress you can use another major feature of Emacs and switch in a completely separate area of memory, or rather of the swap File/Core virtual memory combination. Just send Control-X Control-B, and the prompt Switch to Buffer will appear, inviting you to type in a name.

Two texts together

As this is a new buffer you type Newbuff, or whatever, by way of identity and after confirming that you are not trying to access a buffer already in existence Perfect Writer presents you with a blank screen that represents the new work-area. A Control-Y at this point will deposit the contents of the Kill Buffer on to the screen. From here on you flick back and forth between your two work areas, picking up text from one and depositing it in the other.

The system allows up to seven of these separate buffers, and the command Control-X 2 splits the screen into two halves, enabling you to do a side-by-side comparison of texts. The total quantity of text the buffers can handle is defined by the size you choose for the swap file.

On a dual-floppy system 64K is about the practical limit, but on the Winchester-based machine I work with the ultimate ceiling, a 256K swap file. I can happily juggle files of up to 40,000 words before the Out of Memory flag goes up.

Text filter

Once your text is edited, step 1, you have to feed it through a filter program, step 2, to ready it for printing. I have already mentioned the disadvantages of this, but on the positive side the process allows you to include a variety of format directives in the text, which the filter converts from ASCII instructions into code that will be understood by the printer program, step 3.

In this respect the formatter works rather like a compiler. An initial header to set up parameters like margins and line spacing will look something like this:

```
@style (top margin 3 lines,
bottommargin 3 lines, leftmargin 10 char)
```

This is wordy, but clear in its intent. If your documents never depart from a standard layout you can set up the defaults when you install Perfect Writer on your system.

If you have several established standard layouts that you use for different kinds of document you can make each header a separate file and use the appropriate one by beginning your text with, for example:

```
@include(Tvscript.hdr)
```

where the file Tvscript.hdr contains the header you always use for TV scripts.

The header can also define constants to be printed at the top and bottom of each page in the same way as WordStar's .he and .fo commands. To set up a chapter heading your text will read:

```
@chapter(The Die Is Cast)
```

which will force a new page before printing, and centre and boldface the title. It will also number the chapter for you. If the document is a technical manual the chapter might be divide into sections, in which case the instruction:

```
@section(Replacing your Dynamo)
```

will produce an underlined, numbered heading in the familiar cc.ss format, where cc is the chapter number and ss is the section number. This process can be continued through @subsection down to @paragraph level.

The one thing missing in all this is WordStar's enviable ability to show you on the screen exactly where the pages are going to break. There is no way round this other than tediously printing out an initial rough draft, but if you have WordStar already it is easy to cheat and transfer the file across to it for the final printing.

Final touches

Perfect Writer produces a standard CP/M text file, with no high bits set and hard carriage-returns at the end of each line. If you want to do a last-minute polish in WordStar you may have trouble readjusting the formatting. And of course none of the @ format commands will make any sense.

The only other thing wrong with Perfect Writer is that the vendors seems to have vanished from their New York offices without a forwarding address. Mail to them remains unanswered, and a transatlantic phone call is met by the metallic tones of a computer voice telling you the number has been disconnected. Can it be that hubris has met its nemesis?

There is little point in lauding the praises of a product you cannot get hold of, but some detective work behind the scenes has revealed that Perfect Software bought the source code for its product from Mark of the Unicorn. This firm sells an almost identical word-processing system in two separate packages as Mince, the editor, and Scribble, the formatter and printer.

You will not get the luxurious blue-bound manual that accompanies Perfect Writer, but the Mince documentation comes with an extensive discussion about Emacs text editors in general. For the programmer it provides substantial sections of source code in case you want to emend existing functions or add new ones. Mark of the Unicorn is to be found at: PO Box 423, Arlington, Massachusetts 02174.

Conclusions

- **Perfect Writer embraces the Emacs philosophy, which is initially less attractive than more familiar word processors.**
- **The system is not particularly easy to use for small quantities of text, but can handle very large files with ease and speed.**
- **Extensive formatting intelligence is built in, which makes it ideal for technical writing.**
- **Perfect Writer, Mince and Scribble are all written in C language, which means the system should become available on 16-bit machines.**

Perfect Writer

```
Perfect Writer 1.03 (Fill) perfect: PERFECT.MSS -100%-  +
Switch to Buffer <CR>: ▌
```

Chris Bidmead looks at Perfect Writer, a package to challenge WordStar.

WHEN CONFRONTED by a word-processing product called Perfect Writer one might pause for a moment's contemplation of the meaning of the word "hubris", and then pass on to more serious matters. After all, who needs a new word processor when we already have an old favourite like WordStar?

Perfect Writer embodies a minicomputer text-handling philosophy call Emacs, which was developed in the Massachusetts Institute of Technology. Emacs design has matured over years of use and is full of good things, but inevitably they tend to clutter up the image of the product for the first-time user. For example, there are over six different ways of moving the cursor; seven completely separate chunks of text can be edited simultaneously; and the screen can be split if necessary for simultaneous viewing of two different sections of the same text, or sections of two different texts.

Back on the shelf

You will already have gathered that there is a great deal to explain about Perfect Writer, and the manual tackles the job thoroughly, but without undue redundancy. It works well as a source of retrospective reference as well as leading you up the learning curve and into the operation. So it was not the manual's fault that within a couple of days I had put the software back on the shelf and returned to my regular word processor.

Two things seemed patently wrong with Perfect Writer as a usable tool. In the first place it appeared too wordy. In WordStar you can change from Insert mode to Overwrite mode by toggling Control-V; in Perfect Writer you have to type Control-X Control-M, which calls up the prompt asking for a mode name, to which you then respond with the word

Overwrite

In WordStar you can include a non-printing comment in a text by introducing it with two dots at the beginning of the line. Perfect Writer insists that you wrap up your comment in brackets and precede it with @comment — the in-built commands in Perfect Writer all begin with @.

The second unpleasant surprise is that printing out a text is a two-stage operation if you want the normal embellishments like underlining. First you have to run it through a format program called PF.Com, and only then is it ready for PP.Com, the program that sends text to the printer. It all makes a major chore out of knocking off a single A4 missive to the tax inspector.

The real strength of Perfect Writer did not strike me until much later, when curiousity and the need to cope with the novelisation of a TV script eventually drew me back to the package. WordStar is often celebrated — by those who do not use it much — for its ability to scroll files of any length through the screen area. This is supposed to be superior to systems like Vector Graphic's Memorite where the work file has to be small enough to fit into what is left of the transient program area once the program is loaded. With Memorite this leaves about 30K of workspace — say 15 minutes worth of a spaced-out TV script, or about 6,000 words of packed prose.

```
(Perfect Writer) Perfect Printer Selection Menu
(C) 1982 Perfect Software, Inc.

      Available options for Perfect Printer are:
        N - Start printing at a page other than page 1
        O - Send to a different output port than the default
        P - Pause for manual insertion of each sheet of paper
        C - Print mutiple copies of the file
        G - Start Printing the file now
        X - Return to the top level of the menu

pp PERFECT
Your pleasure: (N, O, P, C, G, X) ▌
```

Too big to handle

A file of this size is handled speedily by in-core systems, but in WordStar is already large enough to show signs of sluggishness, particularly when you try to scroll backwards through it on a dual-floppy system. Perfect Writer's virtual-memory approach is potentially much slicker. One section of the program manages a notional internal buffer that is mapped in 1K segments on to a large disc file, called a swap file. The mapping is done in such a way as to pretend to the rest of Perfect Writer that the whole space is available as core memory.

This is not a million miles from the WordStar idea, except that true random access is used in the mapping. When you scroll to a piece of text that is not actually in memory the memory-management system brings in the relevant block, quietly writing another section of recently revised text back to disc to make room. Segments of text that have been scrolled through the screen but not revised are recognised as not needing recommital to disc and are left alone.

The memory manager keeps trying to anticipate your next move by checking the text in core to see if it differs from comparable sections of the swap file. In the intervals between your keyboard entries it nips in and squirrels revised sections back to disc.

All this is supposed to happen unobtrusively, but of course a lot will depend on how well your backing store behaves. On my stately twin Micropolis drive system the effect was sometimes like that recurrent dream of trying to swim through creme caramel. Before it can go into operation on a text file Perfect Writer has to transfer all the data into the swap file, and with the Micropolis drives this seemed to take forever. Once loaded the system was usable, although the Swapping message it sent whenever there was internal housekeeping to be done tended to hold things up.

Pefect Writer was working well enough to give a picture of how it ought to behave with a speedy disc behind it. Happily at this point the office acquired a very fast hard-disc machine, the Almarc Series 8, and I was able

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Apple words

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different from those in Format 80, but just as useful. Executive Secretary will allow you to specify index entries while you are typing a book. As the manual says: "An alphabetical index is one of the last things produced for a book since it can't be completed until page numbers are known, and its completion can delay final publication. Indexes are difficult, and indexes are often omitted."

The indexing commands in Executive Secretary record the number of the page on which an entry occurs and, at the end of printing, the entries are sorted alphabetically, combined and formatted. Marvellous.

Unfortunately the cursor controls are unimpressive. The cursor returns to the beginning of the same line when it reaches the end of a line, rather than following the text on to the next line down. When using an 80-column board you have to press the command to return the cursor to the start of the line twice for it to be effective, the first entry places the cursor in the centre of the line. Unlike Applewriter II you can always see text as you enter it on to the screen, but if you want to type a line of characters that is longer than the width of the screen a word processor should recognise that this is a special case and should not wrap the line on to the next line down.

If you have the time and are aware of the failings of the program, Executive Secretary has a charming dialogue with the user and some unique facilities that you may find invaluable.

Super-Text

Super-Text appears to be a straightforward program, a hybrid of Letter Perfect and Applewriter II. I was unable to use the program sensibly in the 40-column mode as I had no lower-case adaptor, and Super-Text will not work with the M+R Sup'r'term board. Nevertheless, the manual makes the program look fairly easy to use.

Super-Text is unique in offering maths functions. The program will act as a 15-digit calculator and will also work on figures contained in a document. You may total columns of figures and perform other calculations using the standard four functions, + − * /, and exponentiation. The results of calculations can be inserted into the text. Values greater than nine digits are expressed in scientific notation.

The program has a form of decimal tab and you can align a column of figures before adding them together. The maths operators cannot be incorporated into the text and there is no facility to automatically recalculate a total if you change one of the constituent entries.

Super-Text has a feature known as Autolink that connects a number of files for the purpose of printing a very long document or searching for and replacing defined phrases in more than one file.

Conclusions

- **If you buy a word processor for the Apple II it is worth going to a shop that will back up the sale. All the companies listed in table 1 answered my questions patiently, sent replacement discs promptly when something appeared to have gone wrong, and provided support for the products they supplied.**
- **The poor quality of several expensive programs for the Apple II is surprising.**
- **Executive Secretary had a tendency to crash with the fateful words, Break in line, a sign of inadequate error trapping. Easywriter locked up and would not use a disc with an Easywriter text on it after it had loaded it successfully at least once — apparantly not uncommon. Format 80 requires you to change your method of typing when you are inserting text. These errors are elementary program design faults. Zardax at least has the grace to admit that bugs do occur and recommends that you should keep your files up to date by saving them to disc at short and frequent intervals — sound advice.**
- **The speed at which the program operates is another fundamental criticism of some of the packages. Executive Secretary is slow in operation. Easywriter Professonal and WordStar were also slow in parts. Whether or not this is important is a matter you much decide. When you examine a program make sure you have a text in the machine that is representative of your work in terms of length.**
- **It is almost impossible to press the Left-arrow key and the Repeat key simultaneously with two fingers on your right hand. Most of the programs used the arrow keys to control the movement of the cursor along a line. You will use the Repeat key frequently when you are editing text and should check the cursor control thoroughly with the Repeat key before choosing one of the programs.**
- **Technical writing is not easy but the manual for Executive Secretary is excellent. Less friendly but still well written are the instructions for Format 80, followed closely by WordStar and then perhaps, Zardax.**
- **I would rank the programs roughly as follows:**

1 = WordStar and Format 80
3 Letter Perfect
4 = Zardax, Executive Secretary and Super-Text
7 Applewriter II
8 Easywriter Professional

Table 3. Core functions present in all the word processors.

- Write a new text
  - Word-wrap available while text is entered
  - Use ordinary tabs
  - Format the text by indenting and centering lines
- Store a text on disc or tape
- Retrieve a text from disc or tape
- Add a text or part of a document on disc to an existing text in the computer
- Change or edit the text in the computer
  - Move the cursor to any part of the document
  - Insert and delete text
  - Find and replace words or phrases
  - Realign text after changes are complete
  - Copy or move a block of text
  - Set and clear tab stops
  - Word-wrap should operate throughout the editing function unless you make a decision to turn it off
- Print a text in the computer or on disc
  - Dot commands or an equivalent to set:
    - Left and right margins
    - Top and bottom margins
    - Page numbering
    - Heading and footer text
    - Page break
    - Form length
    - Justification
    - Line spacing
- Continuous stationery or cut sheets
- Link files to print documents larger than the computer memory
- The program should accept material typed at the keyboard. The keyboard should behave as nearly as possible like a standard typewriter. This review is not about alternative-chord keyboards such as that on the Microwriter. The Shift and Shift-lock keys should function normally — Format 80 is the only program in the review to achieve this. Dedicated keys should be used for special functions where possible, particularly for editing where the peripheral position of the keys will not slow text entry.
- Most common paper sizes allow between 60 and 80 characters on each line. For some word-processing tasks it is not essential that the full 80 columns should be displayed but it is easier to edit text and prepare tables on a screen that is wide enough so that "What You See Is What You Get", WYSIWYG.
- True lower-case descenders in which the down-stroke of letters, such as q, y and g, is below the line of the text makes a display far easier to work with for long periods. The 80-column boards available for the Apple II vary in their ability to display descenders.
- Dot commands are special non-text lines entered into a document for purposes such as setting the paper length, specifying a heading or the current page number. A full stop in the first column of the line is assumed to be impossible in normal text and signifies to the computer that the rest of the line is to be treated as a printer command. Zardax uses Control-0 instead of a full stop — the effect is identical but less prone to error.

program when it is printing to select only certain records. Format 80 will search on one or more fields within each record and the keywords can be linked by Boolean operators. These facilities are comparable to those in Executive Secretary.

Unfortunately word-wrap does not work when you are inserting text, and the manual instructs you to enter a return character at the end of each line. Most of the time this is unnecessary as the words seem to wrap on to the next line when needed. If they don't you will have to put some time and effort into eliminating the broken word, which breaks the flow of your typing.

Format 80 is not perfect but it is one of the word processors that I would feel confident about using for important work.

Letter Perfect

Letter Perfect is delightfully primitive. The cursor is controlled by the two arrow keys for movement backwards and forwards along a line and Control-V and Control Y are used to move the cursor down and up one line respectively. So far so good. But Control-K moves the cursor to the beginning of a line and Control-Z to the end. If you think that is logical because Z is at the end of the alphabet, what about Control-X which takes you to the beginning of the text?

Despite these eccentricities Letter Perfect behaved consistently. It is not

particularly easy to use because there are many low-level functions that must be carried out one after another in order to achieve the result that you want, but each command or function did what was promised in the manual.

Let me quote from the instructions to illustrate what I mean by primitive: "When you edit, you will cause the text to be pushed around ... As you insert or delete characters, you may find that you cause a single word to be partly at the end of one line and partly at the beginning of the next line. After you have edited a text for a period of time, you may find the text difficult to read. To correct this you will use the improve text feature. The screen will turn blank and then go back to the beginning of the text. As you advance through the text, you will find that all the words have been reparsed. Words that did not fit on the end of a line have been put at the beginning of the next line. This will allow you to read the text with ease."

But why does that have to be a special function that takes you back to the beginning of the text, losing the place at which you were editing? Reformatting the screen, which is your window on to the document held in the computer memory, is a straightforward piece of programming that should be used automatically after any command that alters the text. If you delete a word the text should close up; if you insert a new sentence the screen should look as though it has been there all the time — as though nothing had changed. In the same way you must manually open up the text by typing Control-I for each letter that you wish to insert, unless you want a whole line to write in. If you do open up a blank line you must improve the text when you have finished or the screen will not reflect the actual spacing between words or sentences.

Like most of the other programs Letter Perfect uses a format line, equivalent to a series of dot commands, to control the printer and the layout of the finished document. You can set one or as many Format lines as you like in a text and the printer will be reconfigured in terms of line spacing and type fount, while the layout can be changed by altering the margins, whether or not the text is justified, turning the page numbering on or off, and so on.

Letter Perfect has some database features that you should explore carefully before deciding that they will do what you want. Overall, I could write with Letter Perfect. The program would not help me to write very fast and editing a text would be a chore after using a dedicated word processor. I would not feel anxious, however, about losing text or being unable to recover from a complex series of editing commands. Letter Perfect seems to offer a reasonable price-to-performance ratio.

Applewriter II

This program is the official word processor for the Apple II. People tell me that it was a great improvement on the original Applewriter. Applewriter II "uses a simple but powerful computer language called WPL, Word Processing Language, to automate the process of text manipulation and document creation."

One dealer said that he used WPL extensively to write specialised word-processing programs for his customers; he said it took very little time to create a particular function that could be called up from the program disc. Fair comment, but for an ordinary commercial office or for a person who wishes simply to use the computer as a tool for writing WPL is wholly inappropriate. WPL programs are supplied on the master disc to link files to print a long document automatically, to replace a word or phrase in more than one document on the disc, and to print a number of personal letters using an address file and a standard letter. Most of the other word processors in the review have these functions built into the program as a matter of course.

The cursor controls in the Applewriter II program are not very impressive for three reasons. First, the cursor splits a line of text, becoming a character on the line — a quirk unique to Applewriter II. All the other programs superimpose the cursor on the character that will be affected by the next command. Secondly, it is impossible to move the cursor into the bottom half of the screen when you are writing or editing using an 80-column card. Finally, when you move the cursor vertically it wanders to an arbitrary position on the line to which it is directed. This is intolerable if you are trying to work under pressure. Coupled with the erratic cursor, Applewriter II sometimes lags several characters behind when you are entering text — like a cartoon hero the screen catches up with itself in a rush after you have stopped typing.

It is possible to work with almost any program that behaves consistently; I found Applewriter II an infuriating program to use because I was never certain where the cursor would go next.

As well as offering the normal search and replace facilities Applewriter II has a glossary function. You may have to enter a long word or phrase many times, adenosine diphosphate aspartic acid is a good example. The phrase can be entered into the glossary with a single key letter at the beginning of the first word. When you are entering text you need only type Control-G followed by the key letter. The phrase in the glossary is automatically entered into the text and displayed on the screen. Applewriter II allows you to save a glossary of words on disc for use at a later date.

Applewriter II is the cheapest program in this review and if you have only enough money for this program then you will be able to edit text, store and retrieve what you have written and print it, using as many layout and printer control features as most of the more expensive programs. With the exception of initial text entry, the program works more quickly than Executive Secretary and comes with a manual that is produced to the usual high Apple standards. There are several good features in the program; you can append a document from the disc to the text you are typing, for example, simply by pressing Control-L and the name of the text you want.

However, if you can afford it I think that Letter Perfect is a better buy — at least try to compare the two before making up your mind.

Executive Secretary

Probably the most user-friendly of the bunch, Executive Secretary is slow. I think the program is written in interpreted Basic and if it was rewritten and compiled it might run at a reasonable speed. The high-level facilities offered by the program rival Format 80. The electronic card-index facilities and the Print Merge functions are

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Apple words

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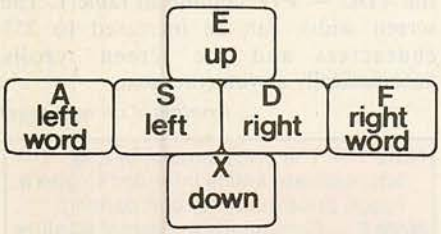
WordStar runs under CP/M, an ageing and abominable operating system. The CP/M operating system requires a Z-80 microprocessor and the Softcard costs about £200. On first running the master CP/M disc supplied with the Microsoft Z-80 card the screen displayed a flashing P and refused to initialise the 80-column card properly. When I installed WordStar and changed the initial help level the program crashed. Only by phoning Pete and Pam Computers could I find the solution — CP/M requires you to switch your printer on before loading the operating system.

Cursor-control keys with WordStar.



None of the CP/M manuals mention this, which is absolutely characteristic of the system and a strong reason for buying your programs from a reputable source who will provide willing and skilled after-sales service.

WordStar now runs without fault and is the most attractive of the systems in the review.

Using WordStar, the printer will always produce what you see on the screen. Print-formatting commands such as justification, double-line spacing, page breaks and centred lines of text work immediately as you type and edit a document. The program has sophisticated Find and Replace commands that will work on some or all of the occurrences of a phrase, in upper or lower case and on a string of characters wherever it appears, or only when it forms a complete word.

Like Super-Text, there are other characters that will carry out special functions in the Find operation; for example, you may match any single character, any character that is not a letter or a digit, any character other than a marked character in the Find phrase, or the two characters Carriage-return, Line feed at the end of each line. The last feature is useful for forming boxes round tables — read the manual to see how it's done.

You can define four printer control code sequences directly using the Install program and some others can be modified to cope with the annoying absence of one-and-a-half line spacing. WordStar is so general purpose that installation is more complex, but not necessarily more difficult, than other programs in the review. Other criticisms include the lack of a command to reform a complete file and the unattractive design of the help messages.

However WordStar is remarkable value for money provided that you are prepared to learn how to get the most out of the system. The WordStar training manual is well designed and takes an operator through a series of lessons. Three books supplement the full instruction manual; *WordStar made Easy* by Ettlin appears to be informative and simple to use.

Table 2. WordStar cursor-motion commands.

^S — Cursor left character. Moves the cursor to the previous character in the file, going to the end of the preceding line if at the beginning of the current line. One common use of this command is to back-space over characters just entered to make a correction. ^H and back-space are equivalent to ^S.

^D — Cursor right character. Moves the cursor to the next character in the file, going to the beginning of the next line if at the end of the current line.

^E — Cursor up line. Moves the cursor up to the preceding screen line. The cursor remains as nearly as possible in the same print column, moving left if it needs to avoid landing beyond the end of a line.

^X — Cursor down line. Moves the cursor down to the next screen line. The cursor remains as nearly as possible in the same print column, moving left if necessary to avoid landing beyond the end of a file line.

^A — Cursor left word. Moves the cursor back to the beginning of a word.

^F — Cursor right word. Moves the cursor forward to the beginning of the next word. This is a fast way to get the cursor to the desired position in a line.

^QS — Cursor to left side. Moves the cursor to the left-most column of the current screen line.

^QD — Cursor to right side. Moves the cursor right to the position after the last character displayed on the current screen line, usually this is not the right edge of the screen.

^QE — Cursor to top. Moves the cursor to the top line of the text area, remaining as nearly as possible in the same column.

^QX — Cursor to bottom. Moves the cursor to the bottom line of the text area, similar to ^QE.

^QR — Cursor to beginning of file. Moves the cursor to the beginning of the document. For a long document, doing a Save, ^KS, is faster and uses less diskette temporary file space if the cursor is currently near the end of the document.

^QC — Cursor to end of file. Moves the cursor to the position after the last character of the document.

^Q0-9 — Cursor to place marker. Moves the cursor to one of 10 place markers. Place markers are set by the operator with the commands ^K0 to ^K9.

^QB — Cursor to beginning of block. Moves the cursor to the beginning of the marked block, and displays the marker if it is presently undisplayed.

^QK — Cursor to end of block. Moves the cursor to the end of the currently marked block, similarly.

^QP — Cursor to position before previous command. Moves the cursor to its position before the preceding command. This command is particularly useful after Saves, to get back to where you were editing, and after ^B paragraph reform, to get back to the point where you were making changes.

^QV — Cursor to start of last find. Cursor to source of last block. Moves the cursor to its position before the last Find or Replace command or to the position of the source of the last block of text moved, copied or deleted, whichever has been used most recently.

Format 80

Format 80 is very nearly very nice. It may be expensive but it is a complete package for writing reports and bulk personal letters, complex mail shots, electronic mail, and card indexing information. The system is supplied with a neat Shift key modification lead that clips into place without any soldering.

Prompt lines at the bottom of the screen set out the commands and functions available to you at any time. Recent additions to the program allow you to save a page of text while typing, simply by pressing Control-Q and the Return key. Format 80 stores text in fixed-format pages on the disc; each page will hold up to 900 words and a disc will hold 17 pages. The text can have consecutive page numbers allocated automatically on the disc or may consist of separate but linked pages on one or both discs. The Search and Replace facility will work automatically on all the pages in a document.

The screen is cleverly organised. It is not possible to scroll the screen horizontally to show a line length in excess of 80 characters. However, you may enter and edit two columns of text on the screen simultaneously before saving them both as a single page. This is useful where material is prepared in both French and English.

The printer-control section of the program, the "installation", is flexible and clearly laid out. It would be useful to be able to keep more than one printer installation on the program disc to cope with draft texts and finished material. The installation contains information about the layout of the document as well as the software control of the printer.

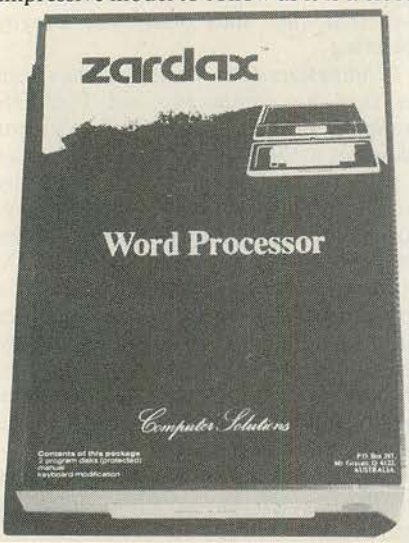
Sorting a list of addresses or other information can be done on any field in the record in ascending ASCII order of priority. A data file can be searched by the

text with the Return key do not prevent other Return characters from appearing on the same line until the text is realigned when a blank line is presented. It produces a certain insecurity; for example, it becomes impossible to guarantee a double-line space underneath a heading.

Finally when I attempted to read the text back into the computer the program insisted that the disc on which the file was stored was not formatted. The program refused to budge and the only way to overcome the problem was to reformat the disc, losing 800 words in the process. The organisation that supplied the program asked not to be named, but said that it never recommended anyone to buy Easywriter Professional as it was difficult to obtain help from Information Unlimited Software, the makers, and this problem was typical.

Zardax

Apparantly this program was written because nobody in Australia could find a friendly and effective word processor for the Apple. Zardax comes in a rigid plastic case containing two program discs, the manual, and a clip lead to carry out the Shift key modification. Installing Zardax is fun as the program works out for itself what sort of keyboard you have. It asks you to press certain keys and configures itself according to the results it gets back. It is an impressive model to follow as it is a closed loop, which will reduce the incidence of problems caused by operator error or ignorance. There are specific installation options for the Epson range of printers in addition to the more usual Diablo, Qume and NEC daisywheel printers.



Zardax will work with either the 40-column screen — lower-case characters are generated by the software — or an 80-column card. The manual contains a lot of information, particularly for programmers who may wish to modify the Zardax system to their own needs.

The cursor controls keep the cursor one or two lines above the bottom of the text area and move the text instead. Thus Control-U, cursor up one line, moves the text down one line. The cursor controls use mnemonics rather than a north, south, east, west layout on the keyboard and Control-L, which moves cursor left one character, is to the right of Control-R. Set against these critisms, you may move a paragraph very easily up or down the text.

There are a number of unusual print commands including: one-and-a-half line spacing for draft purposes, conditional page break, and seven user-definable commands. With an 80-column screen and 48K RAM Zardax will hold a document 21.5K long. With 64K the maximum text size is 31.5K.

The Zardax information manual seems honest, informative and easy to use. The main problem is the lack of word-wrap on text input and editing and the design approach to cursor movement. Although it is possible to merge two files while printing, I was unable to find any way of searching through a list of records to find a selection that matched the user's criteria.

WordStar

WordStar is the reference point against which other packages are measured. That does not mean it is better in every respect than other programs. It is the basis for several dedicated systems and feels like a solid and well-designed piece of software.

WordStar is not user friendly, but neither is it actively hostile. It is, instead, "user indifferent": the facilities are there and, if you use them, the program responds to the level of skill you have achieved. Table 2 illustrates the approach to controlling the cursor used by the program designers. There are 17 cursor movements and, additionally, commands to scroll the screen up or down one line at a time or by the screenful. You may make the program repeat a command at a variable rate by entering ^ QQ and the command letter. The ^ sign represents the control key.

WordStar has no footnote instructions, cannot add a binding margin to alternate pages for the production of reports and the basic package does not include facilities for merging text with names and addresses. On the other hand WordStar can be used to edit Forth and Basic programs directly, as can Letter Perfect, has no memory-based limitation on the size of files that can be edited at one time, and can be extensively customised and adapted to a user's requirements. WordStar is the only word processor in the group that will print one document while you are editing another on the VDU — P/E column in table 1. The screen width can be increased to 255 characters and the screen scrolls automatically as you enter text.

(continued on next page)

40 cols	WYSIWYG	Print merge	Search	Sort	Recover deleted material	Glossary	Decimal tab
yes	no	yes	yes	no	yes	yes	no
no	yes	yes	yes	no	yes	no	no
yes	no	yes	yes	yes	no	no	yes
no	yes	yes	yes	yes	no	no	yes
yes	yes(4)	yes	yes	no	no	no	no
yes(5)	no	yes	yes	no	no	no	yes(6)
no	yes	no(3)	no(3)	no(3)	no	no	yes
yes	yes(4)	yes	no	no	no	yes	no

Note 1 — The price shown, in £, is approximate and is intended to give a rough price guide for comparison.

Note 2 — Commands in Format 80 allow you to save a page while typing a text. The page number is increased by one without intervention by the user. WordStar acts as a window on the whole text file held on disc, consequently the size of text held in RAM is irrelevant and the maximum file size is about half the disc capacity.

Note 3 — Mailmerge, SuperCalc and Datastar will all work with WordStar to provide these functions, albeit at extra cost.

Note 4 — Videoprint or a similar feature is a way of displaying the text in the computer as it will print on paper. The output from the print section of the program is diverted to the visual display unit rather than the printer. Unfortunately, in Zardax you cannot edit the displayed text.

Note 5 — Supertext II will work with the standard 40-column screen on the Apple but requires a lower-case adaptor; without the extra chip the screen displays meaningless ASCII characters instead of lower-case letters.

Note 6 — Supertext II is unique in this collection of programs in offering maths functions + − * / and column total. As part of this package you may align a column of figures.

Note 7 — Y indicates that the program has the facility to transmit and receive files by telephone using either an acoustic coupler or a hard-wired Modem.

Note 8 — Y indicates that the program will print one file while another is being edited. The response time of WordStar to editing commands remains the same but the printing speed falls considerably.

Differences in Apple words

Elderly and fundamentally ill-suited it may be, but the Apple II is still the basis for numerous WP packages. John Dawson tackled the task of comparing them.

ON THE FACE OF IT, the Apple is not ideal for use as a word processor. The standard machine has no separate cursor or numeric keypad arranged so that keys point to the top, bottom and each side of the screen. There are no dedicated function keys and the screen display is only 40 columns wide and lacks lower-case letters. The original machine needs software modification before the shift keys work in a way that would be familiar to a typist. However, additional hardware is available that will correct all these problems.

So why choose the Apple II for a comparative review of word processing programs?

First, the Apple is probably the most popular small business computer of all. About 650,000 Apples have been sold world-wide, and the software base has to be seen to be believed. It means that a large number of word-processing packages are available. Also, someone who buys an Apple to run a specialist program — say, to design concrete beams for buildings, or to record details of patients' medical history — will probably want to do word processing as well.

Second, many of the programs which run on the Apple are also available for other machines, so the review is not only for Apple users. For example, the review also includes the most popular CP/M word processor, WordStar, running on the Apple with a Z-80 Softcard.

The following equipment was used to examine the programs: Apple II Europlus Revision 7 with 48K RAM, 16K expansion RAM board, M+R Sup'r'Term card, 80-column display, DOS 3.3 16-sector disc drives, Microsoft Z-80 Softcard with CP/M, parallel printer card, Epson MX-80F/T printer, and a Philips monitor. With this configuration it is impossible to examine the interaction between the programs and daisywheel printers or how the programs worked with other 80-column cards.

All the programs in this review include the core functions in table 3. The distinction between packages is the extra function incorporated in the package and the manner in which the various functions are performed.

The way in which a word processor interacts with the user is of greater importance than in most other microcomputer software. Very few other packages offering complex command choices are designed to be used continuously for hours on end. Terminals for finding information and confirming a transaction — say airline reservation computers — are used only intermittently by the operator.

The design of the dialogue between the computer and the user can make or break a package. At the most fundamental level the program should be written to take account of the job that it is to do. A word-processor program should respect your appreciation of the language you write in, it should not attempt to distort the way you view a document.

All the packages in the review will search through a text for a specified set of characters. This function allows you to find a word or phrase and replace it with another. However, most of the packages will find the set of characters inside a word and carry out the exchange with bizarre consequences. If you want to change "format" to "layout" and this problem occurs, you will find yourself with "inlayoution", which is not very informative. Most of the packages allow you to avoid this problem in one way or another but the default operation of the program, the way if operates if you leave it alone, should correspond with the way you look at words — as a whole, not as a set of strings of characters.

Easywriter Professional

Easywriter Professional has been developed out of an earlier version which used the standard Apple 40-column display. The program is popular and should be fast in operation as it is written in Forth. Unfortunately, the instruction manual although superficially friendly omits large sections of important information. For example, there is no description of the error messages that the system may generate and how to correct the fault.

The hard carriage-returns put into the

Table 1.

Name of program	Supplier	Telephone	Price (1)	Max.file size in RAM (2)	Cursor	Manual	Help	Phone (7)	P/E (8)	80-col boards
Applewriter II	Apple Computers	—	85	30,460 chars.	*	***	yes	no	no	1 7
Easywriter Professional	—	—	140	12,287 chars.	**	*	yes	no	no	1 3 4 5
Executive Secretary	Keen Computers	0602 412777	235	3,100 words	**	****	no	yes	no	1 3 5
Format 80	Personal Computers	01-377 1200	300	900 words	***	****	no	yes	no	1 2 3
Letter Perfect	Pete & Pam	01-769 1022	100	42,239 chars.	**	***	no	yes	no	1 3 5 6
Supertext II	Village Com. Serv.	01-743 9000	85	14,904 chars.	**	***	no	no	no	3
WordStar	Pete & Pam	01-769 1022	145	Irrelevant	****	*****	yes	no	yes	1 3 5
Zardax	Rocon Ltd.	0235 242306	170	31.5K chars.	**	****	no	no	no	1 3 4 5 6

80 column boards key: M+R Sup'r'Term, 1: Omnivision, 2; Videx Videoterm, 3; Doublevision, 4; Smart Term, 5; Vision 80, 6; U Term, 7.
The list and the codes are not necessarily definitive. Check with your dealer before buying.
For notes see panel on the right.

– in fact this can be done automatically.

You are obliged to protect yourself against power failures, coffee spills and other natural disasters, but the software must protect you against erasing text by accident. For example, it could ask: "Are you sure?" and wait for confirmation. It must also be pretty much crash-proof.

Before you buy a package, try saving to disc with the drive door open, try printing without the printer turned on, and other things which people do by accident all the time. If the machine dumps your text — and perhaps the program too — into the void where it is lost forever, then don't buy it.

There is also this myth that, say, a Centronics port on a micro will always connect with a Centronics port on a printer, and that if they do, a word that goes in at one end of the cable will result in the same word on the paper. Sometimes it does, and sometimes it doesn't.

Sod's law proves that either one of the plugs has to be totally rewired, or the printer reconfigure, or both, and then only the software needs rewriting . . .

The same myth underlies the idea that all, or at least most, CP/M programs will run on most CP/M machines. This conveniently forgets the half hour it can take to configure the thing to the terminal you are actually using. And so on. The way to avoid such problems is to buy all the items from one shop. Let the dealer worry about connecting them up.

The final choice of package will depend partly on the kind of WP you do, and therefore what facilities you need. A manager, for example, usually needs the simplest possible system or perhaps one that checks spelling and does maths too. A secretary, by contrast, will often need merge facilities and elaborate formatting commands.

A journalist will want a system with a large print buffer that will hold all of a 5,000-word article. A book author will generally prefer a paged system, so as to be able to call up page 37 while working on page 240, without scroling through masses of text.

The accountant will want at least the decimal tab facility, and probably a WP package that will integrate with a spreadsheet program. The home user will probably want a cheap package with a good teaching manual, as a substitute for proper training and dealer support.

There are hundreds, if not yet thousands, of WP programs to choose from, and most well-established micros will run at least half a dozen. With so many to choose from it is impossible to survey them all, but the remaining articles in this section will provide the information you need to choose something that should suit you.

Touch-typing

Ten fingers are better than two when it comes to word processing. The "hunt and peck" approach to typing is very slow and inefficient when compared to touch-typing. Speeds of 30 to 40 words per minute are quite easy to achieve and experienced typists can work from two to three times as fast.

While a typewriter will never teach you to type, a micro or CP/M word processor can. All you need is a touch-typing program and the will to learn. Programs are available to run under CP/M and there are several others for small micros including the Atari and Dragon.

Usually they work by providing drill for you to practise, starting with aaaa or something equally simple, and ending with whole paragraphs of text. The micro logs your errors and times you, so that after each drill you can be given a rating for accuracy and your typing speed in words per minute — something you cannot get in a typing class using ordinary typewriters. It allows a precise degree of feedback which makes for rapid progress in learning.

Versions written for particular machines can display the keyboard layout on screen; the Atari touch-typing course does this very well in colour graphics. CP/M versions may not have a screen display, and the one in The Typing Master is "admittedly poor" because of the impossibility of providing one for a wide range of different display terminals. Caxton Software's Touch'n'Go does not display the keyboard layout at all.

Another important point is the way errors are checked. The Atari program demands that you type exactly what you are shown on the screen, letter for letter and space for space. It evaluates the result by making a direct string comparison. You have to be careful that an error at the beginning of a line is not continued so that your later correct typing is marked as wrong.

The Typing Master offers a choice of either position-dependent or universal error checking at the higher levels. The universal checking takes more account of what you actually typed correctly, but it can be deceived by anagrams and transpositions. It does not distinguish between hewn and when. Touch'n'Go uses a very sophisticated error-checking routine which compromises between the two choices.

In the end it is best to aim for complete accuracy. As the author of The Typing Master points out, accuracy comes first and speed comes later.

All three programs will take you to 30 to 40 words per minute in some 30 half-hour sessions. They can also be used for revision practice. The Atari has a neat random-sentence generation function. Most of the sentences it produces are quite ridiculous as English, but for typing practice this is no great drawback.

Both Touch'n'Go and The Typing Master keep good records of your performance on each test so they could be used for serious classroom teaching. The Atari is only for home or personal use, but there is a separate version of The Typing Master for business and classroom work, called the Configurable Business Version.

Atari International (U.K.) Ltd, 185-195 Ealing Road, Wembley, Middlesex HA0 4QU. Telephone: 01-900 0511

The Typing Master, Anthony Ashpitel, 56 London Road, Harleston, Norfolk IP20 9BZ. Telephone: (0379) 852807

Touch'n'Go, Caxton Software, 10-14 Bedford Street, London WC2E 9HE. Telephone: 01-379 6502

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disc is valuable because storage and retrieval is so much faster than with floppies; the amount of storage space is much greater too.

Screen displays vary a great deal, and can greatly affect the usability of a system. The screen should give a sharp image and have an anti-glare finish. Both brightness and contrast should be adjustable. Most importantly, the screen should be placed somewhere where it does not reflect a window, but where both the keyboard and workspace are well lit. It is the neglect of these points rather than the hardware itself, that leads to problems with WP installations.

The number of characters displayed also depends on several factors, but some set-ups offer the choice of either half-page or full-page screens. A half page is usual — 80 characters by 20 to 25 lines. A full-page display usually means a vertical screen showing 80 characters by 60 lines, which is what will be printed on a full sheet of paper. Some screens are switchable and can be rotated to allow both choices.

Some systems carry the imitation of a sheet of paper to absurd lengths, printing black letters on a white screen display. This can be very fatiguing, though no doubt some operators will like it. In some countries, legislation enforces the use of particular colours for screen backgrounds.

The 80-character width is now established. It originates partly from the 80-column width of the punched cards used by early word processors, but 80 characters is, as it happens, a good width for printing on A4 paper.

The choice of printer is particularly important, and will be dealt with in a special feature in a future issue. Briefly, the traditional choice is between an expensive and slow daisy wheel printer and a cheap, fast dot-matrix model. A daisy-wheel printer gives top-quality printing, often better than an electric typewriter. A dot-matrix printer normally gives a low-quality image, the letters being made up of a number of dots.

The dot-matrix printer, however, has the further advantage of being able to handle graphics, and can easily offer a wide range of type styles within a single text. Condensed, extended, emphasised letters and italics are all possible.

At the moment two significant developments are taking place: the image quality provided by dot-matrix printers is improving, and some now approach daisywheel quality; and the price of daisywheel printers is coming down. Daisywheels are still the choice for letter-quality results, and dot-matrix printers for everyday use, but for businesses this often means buying both. The future development of low-cost ink-jet or laser printers — or even something as yet unheard of — may solve this problem, but it hasn't yet.

Communications is another area where future developments are likely to prove extremely important, though not many manufacturers have yet got the show on the road. It is not just a matter of networking so that a group of WP work stations can share hard discs and printers: networking is likely to prove important in encouraging the growth of electronic mail.

So far only the Torch micro has British Telecom approval for direct connection to the public telephone system, and many micros still lack Modems and terminal facilities. Yet if both sender and recipient have microcomputers, it is silly to print a text out on paper, put it it in the post — at great expense — and wait one or more days for it to be delivered when it could be shot down the phone line in a few minutes.

Communications could also be very important for authors and publishers who are preparing texts for typesetting. At the moment a magazine article might be typed three or more times: by the author, by the publisher, and again by the typesetter. This is not only cumbersome, it is expensive and introduces many unnecessary errors.

Some printers are already adopting microcomputers for use for text entry, as being much cheaper than dedicated typesetting machines. Some typesetters — Verbatim Graphics in London and Worsmiths in Bath, for example — already accept WP copy down the phone. With a facsimile machine, a proof of your typeset text could be sent back to you within minutes. Typesetting costs can be cut by 50 percent or more.

In the long term, so many small companies, individual authors and home users will run WP on their own account that the problem will disappear. The unions and companies that do not automate will go bust, leaving the field open for WP.

A word processor should ideally be easy to use. Most of them are easy to use for entering and printing text, but some of the less often used commands can be harder to learn. Ideally, therefore, the documentation should have four distinct parts:

- A key-by-key guide to getting started, so you can start using the program straight away.
- A thorough guide to all the facilities — the manual proper
- An alphabetical reference guide to the commands used
- A single-page crib sheet for use as a memory jogger

Very few packages have good documentation. The Atari word processor is an exception, and it is worth looking at if only to see how these things can be done. The package also includes two master discs, a six-chapter tutorial, a data disc, and a teaching tape, plus much else. Altogether it weighs 5.25lb. A self-teaching disc and/or built-in help routines can also help with learning how to use WP properly.

The two worst problems that can occur with WP are the loss of text, and difficulty in interfacing printers. Loss of text can be a disaster, and WP software must be designed to protect against it. You can help to protect yourself, of course, by taking frequent back-up copies of texts as you work on them

Cassette, disc or ROM

A WP program might come on a cassette, on a floppy disc, or in a read-only memory or ROM. A cassette-based program is OK for a home user, but not for serious use or for business. The problem is not that it takes longer to load such a program, but that it takes a long time to save and recall texts.

As tape is a serial medium, it can be difficult to find the beginning of a particular text for loading — just as it can be hard to find the start of a particular song on an audio cassette. Cassette-based WP programs have the single advantage of being cheap. Many home micros do not have discs available, and in these cases you generally have to make the best of a bad job.

Disc-based WP is the most common, and provides fast saving and recall of texts. A disc system can only make filing easier by providing a list of all the files — or texts — on your work discs. The best WP packages provide their own disc-directory routines, and allow file names of, say, 35 characters rather than eight. The chance to use meaningful file names makes finding the texts you need much easier.

A good WP disc system will also record, perhaps, the author's initials, the date a file was created, and when it was revised or last printed. In some cases it even records how long it was worked on and how many keystrokes were used. Such information can be invaluable. With disc-based WP packags it is best to have a back-up copy of the program, plus back-ups of all work discs stored in a different place from the work discs themselves.

A ROM-based WP program loads fastest of all, and is therefore the most convenient to use, but texts will normally be stored on disc as before. ROM packs are normally very reliable, but have the disadvantage of being more expensive than discs. As an example, the ROM version of Letter Perfect for the Atari costs almost 50 percent more than the disc version. ROM-based WP programs are also available for the Vic-20, Exidy Sorcerer and BBC Micro, among others. A ROM is generally seen as a substitute for a cassette system for the home user, but may also be the choice for dedicated word processors for use by people who are not computer experts.

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faster than the printer can print it, so you cannot continue working while a long document is being printed out. The best WP packages have concurrent printing, which allows you to start a new text while the last one is printed. Some packages will also allow a print queue of, say, three or four documents, which await printing in their turn. One way round the problem is to fit the printer with a large buffer to hold the text, and thus free the micro for further use.

Word processing can be done either with a dedicated word processor or using a WP program on a general-purpose computer. A year or so ago the dedicated machines were the most user friendly and had the most facilities, but were more limited than micros and cost around twice as much. But now most dedicated word processors can also support CP/M — or they soon will — which makes them more versatile, and the prices have come down a lot.

Word-processing packages for micros have improved somewhat, and some are excellent — Omega Level B on the Compucorp and For:Word on the Fortune 32:16 are examples.

Some dedicated word processors from big companies are still a rip-off, but many are now a good buy if the machine is to be used mostly for word processing. The dedicated keyboard is a big advantage, and most are of far better ergonomic design than general-purpose micro keyboards. On the other hand, dedicated keyboards can be supplied for some micros — Haywood does one for WordStar, for example — and many new micros are a huge advance on old stalwarts like the Apple II.

In the near future it seems most likely that the two technologies will converge. The only difference between dedicated word processors and micros will then be the way they are sold. Companies selling word processors should also sell support and operator training, and at the moment companies specialising in WP seem to do this better than micro dealers.

When selecting a system the old advice is still the best advice: choose the software first, then choose the hardware to suit. Even so there are some areas to watch when it comes to hardware. The three main considerations are keyboard, discs and screen.

Discs are used to store text with most systems, both dedicated and general-purpose micros. Cassettes are too slow, and it is too difficult to find texts on them. The main points to watch with discs are the total storage capacity, and the speed of input and output. Some dedicated word processors have only limited storage per disc, so check this as well. If the money is available, a hard

(continued on next page)

Usual WP functions

- **Automatic word-wrap. You should be able to enter text without watching the line length. Words that are too long should automatically be taken over to the next line. Some packages offer a soft-hyphen feature, where long words will, if necessary, be hyphenated and split over two lines when printed. Hard hyphens are those which are actually typed in and are fixed.**
- **Tab settings. As on a typewriter, a WP package should allow tabs to be set within the text, not just margins on printing out. This is invaluable for tables. A decimal tab function is useful: it automatically aligns decimal points in tables of figures, so £10.96 can be accurately positioned underneath £1,096.24, etc.**
- **Margin settings. Left and right margins should be variable within the document. For some texts it is useful to be able to have right justification, so all the lines line up on the right as well as on the left, as in the printed columns in the main part of this article.**
- **Automatic centring: useful for headings.**
- **Block move. Sometimes you may need to move a whole block of text, such as one or more paragraphs or a whole page. Pointers are used to mark the beginning and end of the block. Useful functions include Move Block, Copy Block, Print Block, Save/Load a block to or from disc.**
- **Search and Replace automatically finds one character, word or text and replaces it with another. For example, this article uses WP to stand for "word processing". Using Search and Replace it would have been possible to change all cases of this abbreviation to the full phrase. The operator can use very simple entries to save typing out repetitive phrases, saving much time and efforts. Search and Replace can be global, as in this example, or for single occurences, under operator control. A useful extra feature is the choice of Exact Search and Hazy Search. An Exact Search for "the" would not find "The", but a Hazy Search would. Hazy Replace will preserve the original capitalisation. This is useful for changing between U.K. and U.S. spellings and similar tasks, if you don't have a spelling-checking program.**
- **Spelling checker. A spelling checker scans the text and stops at or lists all the spellings it does not recognise. That is to say, words that are not in its dictionary. Some of these will be spelt wrongly, and can be corrected. Others will be obscure words. A useful feature of some spelling checkers allows you to add these words to the dictionary, to customise the dictionary to your own special interests. The spelling check is usually run as a separate routine after the text has been completed. Often it is not part of the WP program itself, but an add-on extra.**
- **Forms entry allows you to set up a form on the screen to match a preprinted or pre-established form set-up. The cursor is moved automatically from one entry point to the next. Sometimes this is used with a Typewriter mode, where anything typed on the WP keyboard is automatically output straight to the printer; however, this deprives you of the chance to corrrect errors before printing the form.**
- **Mail Merge may be a built-in or extra program which takes names and addresses or other information from a separate file and inserts it in a form letter or invoice. It is most useful if the package also allows searching and sorting. A merge facility might also be used to produce letters assembled from standard paragraphs — a useful facility for solicitors, etc.**
- **Macros. A macro is a routine which can be set up by the operator and called separately, or else assigned to a function key, if available. It allows multiple keystrokes to be reduced to a single keystroke and is useful for adding, say, a series of signature lines to a document, or setting up chapter headings, etc.**
- **Maths. A calculator function allows you to do maths within the WP program, instead of having to do it beforehand or separately.**
- **Disc utilities. With a disc-based WP program it is useful to have access to disc utilities from inside the WP program. It saves the horror of having a long text in memory and no formatted disc to save it on. Some packages will allow other programs to be run from inside the WP program.**

Keyboards

In one way, the keyboard is the most important part of a WP system, as it is — literally — the user's main point of contact with the system. Yet as long as a keyboard reaches a certain mechanical and ergonomic standard, the precise details do not seem to matter very much. In time, users can become accustomed to almost anything.

The mechanical and ergonomic standards include key spacing and the amount of travel of the key. The keys should feel positive in use, and must not "bounce" to produce double letters when single ones are required.

Good modern keyboards tend to be very low and relatively flat, rather than steep like office typewriters. The keys should give an audible — if electronic — click when pressed home, and this click should have a volume adjustment. Each key should give auto-repeat if it is held down for more than half a second. This facility is sometimes user-programmable — as on the Acclaim microcomputer, for example.

Most keyboards nowadays conform more or less to the *de facto* standard of the IBM Selectric typewriter. At least, they conform in the positioning of the alphanumeric keys in a QWERTY arrangement.

Unfortunately there is a tendency for designers to put punctuation marks and other incidentals in different places. The quotation mark, for example, may appear as Shift-2, or on the middle row of letters next to the Return key. Neither is really wrong, though the Shift-2 position is now considered somewhat old-fashioned.

One of the problems is that a computer normally requires more characters than a typewriter. Where a typewriter may have 88 characters on as few as 52 keys, a computer may have 128 characters on from 57 to 90 keys. There is the temptation to squeeze extra keys into the QWERTY layout, though this is wrong and should be resisted. IBM, DEC, Sony and other companies have made the mistake of inserting extra keys into the standard layout next to the right or left Shift keys.

Another bad error is to move the Backspace key to an odd position, and a worse one is to reduce the size of the Return key, or insert an extra key next to it. Anyone familiar with a standard keyboard — which means most WP operators — will continually make annoying mistakes when using such keyboards.

The most important extra keys on the computer keyboard are the four cursor-control keys. Using two keys, as on the Apple II and Vic-20 micros, is much less convenient.

Even designers who find room for four keys often fail to get them in the best order, in the shape of a cross. The Epson QX-10, Fortune 32:16 and Adler Alphatronic P-3 and P-4 are among the micros with keyboards where the cursor controls have been sited correctly.

Function keys and numeric keypads are now common additions to the standard keyboard. Both of these groups of keys should be placed well away fromthe standard QWERTY arrangement. Numeric keypads on computers normally have 9 in the top right-hand corner, while telephone keypads have 1 in the top left. The difference does not seem to confuse.

Alternative keyboards

The QWERTY keyboard has been around since the last century, at which time there were many alternative layouts. Since then, numerous new keyboards have been designed, all claiming superiority to QWERTY.

An early example was the Ideal keyboard, launched in the 1890s. It was based on the idea that more than 70 percent of English words are made up of the letters D,H,I.A,T,E,N, S,O and R, so putting these keys in a line should make typing easier.

The most interesting alternative was suggested by August Dvorak in 1943. His idea was to place the five vowels under the left hand and the five most common consonants — D,H,T,N, and S and — under the right hand. As before, the idea he failed to catch on. The QWERTY keyboard was already too entrenched.

A more recent suggestion has come from Lillian Malt and Stephen Hobday in Farnborough, who read in an article in *Ergonomics* in November 1974 about the physical stresses caused by the conventional keyboard. They studied the way the hands and fingers worked when typing, and researched the most comfortable positions. They analysed 1,000,000 words of text to find the most common letters, and placed them so that 90 percent of the 100 most-used words can be typed with the fingers on the "home" line.

The result of all this research is a radically different keyboard, which users are said to find very comfortable. But the same old problem remains: people who have learned on the QWERTY keyboard do not see why they should learn to type all over again.

To counter this objection, the Maltron keyboard is ROM-switchable between QWERTY and the new layout, so QWERTY users can still benefit from the improved ergononmics. Hobday argues that learning a new keyboard is like learning a new language. Users who know both can happily switch between them without confusion.

Soft keyboards

Some modern keyboards are now often fully programmable so that any character can be assigned to any key. This is the case with the Victor 9000/Sirius 1 and Epson QX-10, for example. It is also a simple matter to exchange one set of keycaps or labels for another. Thus the way is now open for people to choose their own keyboard layout, and even to switch between different layouts.

It seems likely that only a few people will take advantage of these facilities. Most will continue with the QWERTY layout, and complain bitterly when computer keyboards vary from this, even if only slightly.

The Maltron keyboard is ROM-switchable between QWERTY and the new layout.

Getting it right with WP

Word processing is one of the most obvious applications of the micro, and one of the easiest to implement. In this introduction to our special 19-page section, Jack Schofield looks at the possibilities and the pitfalls.

IN THE RUBAIYAT OF OMAR KHAYYAM, Fitzgerald wrote

The Moving Finger writes; and, having writ,
Moves on: nor all thy Piety nor Wit
Shall lure it back to cancel half a Line,
Nor all thy Tears wash out a Word of it.

Obviously he wasn't using a word processor.

The essence of word processing — WP for short — can be summed up in three words: store, edit, format. When using a typewriter there is a direct connection between action and result: you press a key, and a letter appears directly on the paper. Though this is very useful — few businesses still use quill pens — it has its limitations.

You have to press the right keys in the right order, and the paper has to be in the right place. Further, if you want two copies of your typing, possibly to send to different people, you normally have to press all the keys again. This is slow, wasteful and boring.

Common typing mistakes include misspelling words, missing out words or even whole paragaphs, and getting the spacing wrong, making a report is less readable than it should be, while areas of the paper are unused. Although some of these mistakes can be corrected, the corrections slow down the job, and corrections nearly always show. The end result tends to look unprofessional, so in business things often have to be retyped. WP helps to solve all these problems.

With WP the keystroke does not produce an impression on paper directly. The keystroke is stored in a memory instead. The typist does not have to worry about errors, as they can be corrected later. After a first draft has been completed, the text can be edited, missing words inserted, and pieces of text swapped about. With all these corrections the alteration is invisible: the finished text looks exactly as though the mistake had never been made in the first place. Finally the text can be formatted, so you can check the spacing and arrangement before it is printed out on paper.

Further, once a text is stored it can be used time and time again. If you want to send more or less the same letter to several different people, the same text can be used, with different names and addresses added later. The recipients should not be able to tell that their letter is not a unique original. Perhaps the worst examples of personalised form letters — usually selling goods by mail order — are now obvious to everyone, but the technique is still very useful for correspondence and invoicing.

Modern business micros can be used to run effective word-processing software.

The simplest word processors and memory typewriters allow the storing, editing and reprinting of text. A dedicated word processor or WP package on a micocomputer may offer much more. The panel on page 95 shows some typical features, though not every set-up will offer all of them.

There are some things it is possible to display on the screen, but not to print. Other things can be printed, but not displayed. This depends on the WP package being used, on the micro which is running it and the printer fitted, so it is not possible to generalise. The uncertainty of not knowing what will happen when is the best argument for buying the micro, the package and the printer from a single source. If you need a particular facility, write this into the contract.

These facilities include superscripts and subscripts, overstriking of letter, underlining, bold or emphasised text, italics, graphics characters and diagrams. Proportional spacing is essential for proper justified text; many printers can provide it, though few micros can display it properly.

Then there is paging, which involves headers, footers and page numbering. Some WP packages are word orientated, and treat the text as one long string of words. Others are page orientated. Whichever approach is applied, it is useful to be able to set the page length — that is, the number of lines on each sheet of paper — and have headings and/or page numbers inserted at the top of each page, and footnotes added to the bottom of the correct page.

Page length can be adjusted automatically to allow for footnote length. With page-orientated packages, adding a paragraph near the beginning of the text can be tedious if later paragraphs then have to be carried over on to the next dozen pages. On the other hand, with page systems what you see on the screen often more closely resembles what is printed on the paper.

Multiple printing is useful if you need several copies of a text.

Finally there is concurrent printing. A micro can send text to the printer much

(continued on next page)

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AJEDIT

.....a new, simple to use, moderately priced word processor..

AJEDIT was introduced as a new word processor some months ago, having been written with ease of use as a prime design requirement. Since then it has achieved market success, so much so that it has gone through two additions, together with the introduction of a Manual specifically aimed at the first user. The documentation now totals about 60 A4 pages.

Arrangements have now been made with Logical Systems, Inc. of the United States, the authors of the LDOS disk operating system, for the inclusion in AJEDIT of a stripped-down version of this disk operating system, called smal-LDOS. This gives to AJEDIT a number of major benefits. For instance it now incorporates "type ahead". This means that if you are typing into the word processor whilst the machine is looking at something else, input is stored and then accepted by the program at its own convenience. One of the major advantages of this, of course, is that it is now pretty well impossible to outstrip AJEDIT in speed, particularly at the most critical end of line time, when the program is very busy tidying up. A further improvement given by the marriage between AJEDIT and smal-LDOS is the key repeat function. If the user's finger is kept on a key for longer than a certain time, then that key will repeat on the screen or, if it is a control key, its function will repeat. Both the delay time before the repeat starts, and the rate of repetition is adjustable. Yet another improvement is the addition of a screen print facility so that at any time the operator may (for instance) print out his source file from the screen, complete with all control characters.

To some users these additional functions and others, such as double density support, will not be of the greatest importance and as the smal-LDOS version of AJEDIT is higher in cost, we will be continuing the previous version.

Both versions of AJEDIT contain close to 100 commands, covering most word processor requirements, including two sets of dedicated printer commands for the Epson MX series and Centronics 737 machines. Three principle advantages of AJEDIT over some other word processors are the ability to access DOS commands from within AJEDIT, the facility to mail merge (whereby a names, addresses and salutations file can be married up to a standard letter), and most important of all, the fact that AJEDIT commands are so constructed that they are easily remembered by intermittent users.

AJEDIT needs 48K and one disk minimum, and is presently suitable for the TRS-80 Models I and III together with the Video Genie Models I and II.

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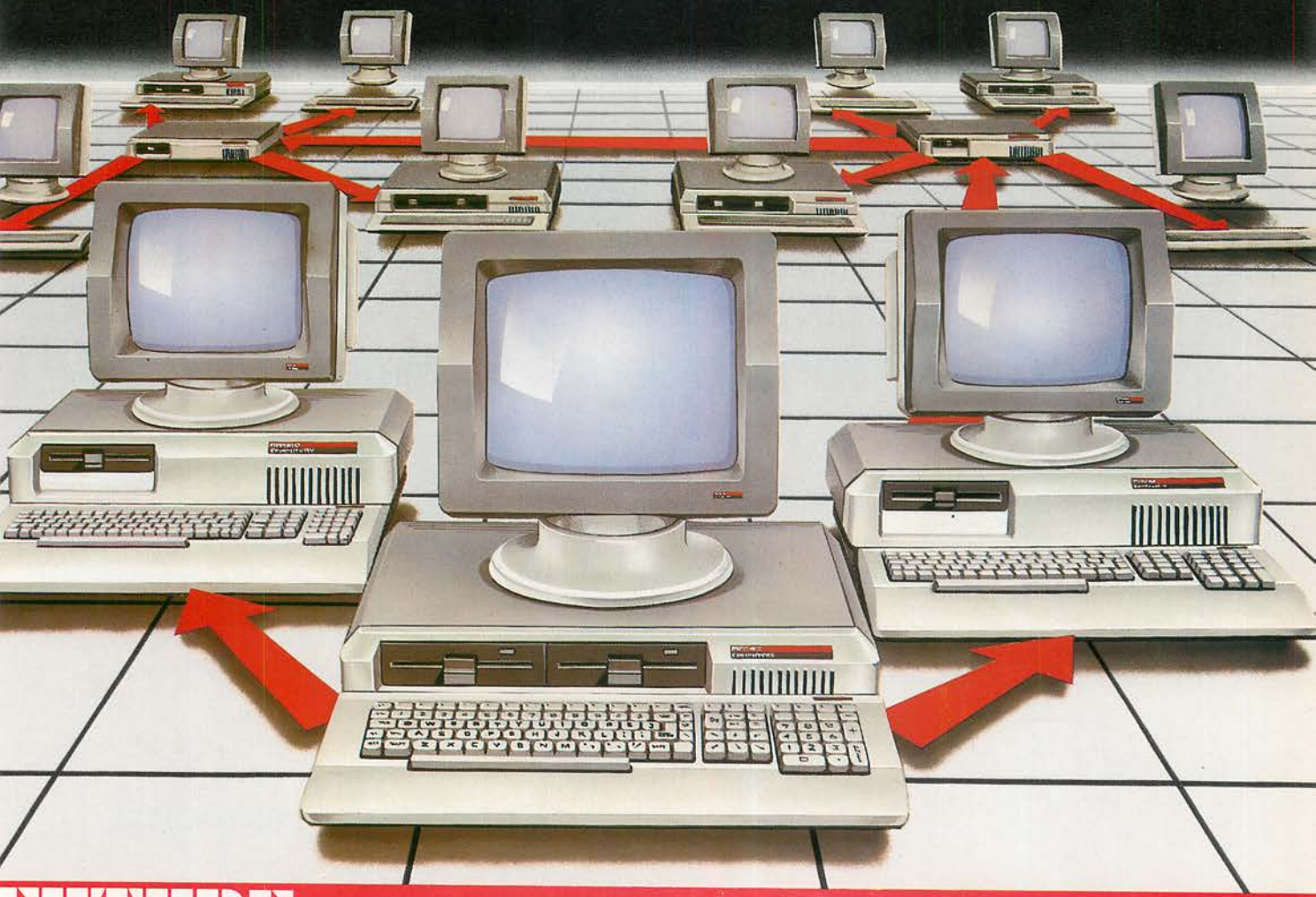

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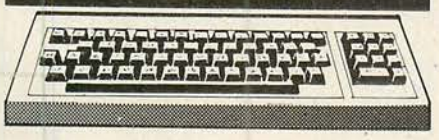
by John Harris



Security password

GRAHAM WILSON of Bristol maintains an Apple II in his office and finds it proves a popular toy, with drastic results when discs are mishandled. This password program has been incorporated in the initialised program on each disc, and as a subroutine on some of his more important programs.

By using Get statements and a subroutine it requests a pre-specified password before allowing the program to continue execution. Admittedly the program does not stop the determined, nor pacify the violent, but it does stop those most likely to damage the discs. It certainly makes a hideous racket if you get the password wrong.

Security password

```
10   GOSUB 9900
20   PRINT "WELL DONE"
30   END
9900  REM *** SECURITY SUBR
9902  REM ***G.B.WILSON 1982
9904 PWD$ =  CHR$ (18) +  CHR$ (1
     5) +  CHR$ (4) +  CHR$ (5) +
      CHR$ (14) +  CHR$ (20)
9906 PWL =  LEN (PWD$)
9908  GOSUB 9990
9910  IF PSL = PWL THEN : IF PS$ =
     PWD$ THEN : RETURN
9912  IF  LEFT$ (PS$,PSL) <  >  LEFT$
     (PWD$,PSL) THEN : HOME : FOR
     PCT = 1 TO 100: PRINT  CHR$
     (7): NEXT PCT: END
9914  GOTO 9908
9990  HOME : INVERSE : PRINT "SEC
     URITY SYSTEM": NORMAL
9992  PRINT : PRINT "PASSWORD=";:
      GET P$
9994 PS$ = PS$ + P$
9996 PSL =  LEN (PS$)
9997  HOME
9998  RETURN
9999  END
```

Gilt complex

The iniquity stakes, operating over a scale from one to 10, has always been crowded toward the top end, the regular high scorers being Imperialist Running Dog at 9.62, Stockbroker 9.68 and Investment Consultant 10. The system falls down only through its inability to cater for bookmakers, but I refer you to Tandy Forum in this issue for further news on that front.

The warning given, I present a program from S D Collier of Llangollen, Clwyd which enables you to analyse the gilt market to select the best-valued stock. It takes into account your own tax position and investment income surcharge liability, though perhaps if you have one of those you will not be needing the program.

This kind of investment is used to generate a fixed income for a known period, for making a capital gain if you pay high rate income tax, or for gambling on a falling interest rate when the share price will rise in relation to the price you paid. You can read all about it in *Which?*, September 1982, or on form SL-605 from the Post Office.

Gilt complex

```
10  HOME : REM (CLEAR SCREEN)
20  INVERSE : REM (INVERSE VIDEO)

30  PRINT "G I L T   E D G E D
     S T O C K"
40  PRINT "        A N A L Y S E R
           "
50  PRINT "
           "
60  PRINT "                B Y
           "
70  PRINT "    S . D . C O L L I
     E R      "
80  PRINT "
           "
90  PRINT "            N O V   8 2
           "
95  PRINT "
           "
100  NORMAL : REM (RETURN TO NORM
     AL VIDEO)
110  PRINT : PRINT : PRINT : PRINT
     : PRINT : PRINT "PRESS RETUR
     N WHEN READY";: GET A$
120  HOME
130  PRINT "USING THIS PROGRAM YO
     U CAN ANALYSE AS"
140  PRINT "MANY GILT EDGED STOCK
     S AS YOU WISH."
150  PRINT
160  PRINT "THE COMPUTER WILL ASK
      YOU QUESTIONS"
170  PRINT "ABOUT YOUR OWN TAX PO
     SITION, AND FROM"
180  PRINT "THIS INFORMATION WILL
      ADVISE YOU OF THE"
190  PRINT "BEST STOCK TO SELECT"

200  PRINT : PRINT : PRINT : PRINT
     : PRINT
210  PRINT "PRESS RETURN WHEN REA
     DY.";: GET A$
220  HOME
230  PRINT "YOU WILL NEED A COPY
     OF THE FINANCIAL"
240  PRINT "TIMES, IN WHICH THE R
     ELEVANT STOCKS ARE"
250  PRINT "LISTED"
260  PRINT
270  PRINT "YOU SHOULD SELECT ARO
     UND FIVE OR MORE"
280  PRINT "-UNDERLINE THEM, AND
     THEN WORK THROUGH"
290  PRINT "THE PROGRAM"
295  PRINT : PRINT : PRINT : PRINT
     : PRINT
298  PRINT "PRESS RETURN WHEN REA
     DY.";: GET A$
300  HOME : REM  (DATA INPUT)
310  INPUT "HOW MANY STOCKS
     ";N
315  PRINT
320  INPUT "ENTER YOUR TAX RATE
     ";BT
325  PRINT
330  PRINT "DO YOU PAY INCOME"
340  INPUT "TAX SURCHARGE (Y/N)
       ";S$
350  IF S$ = "Y" OR S$ = "N" THEN
      GOTO 360
355  GOTO 340
360  PRINT
```

(continued on next page)

(continued from previous page)

```
361  IF S$ = "Y" THEN BT = BT + 1
     5
370  PRINT
400  REM (INPUT STOCKS DATA)
410  DIM SK$(N),SC(N),SY(N),SF(N)
     ,SR(N),SP(N),SG(N),NY(N)
415 BR = 0:P = 0: REM (VAR. FOR F
     INDING BEST STOCK)
420  FOR I = 1 TO N
430  HOME
440  INPUT "NAME OF STOCK          "
     ;SK$(I)
450  PRINT
460  INPUT "YEARS TO MATURE        "
     ;SY(I)
470  PRINT
480  INPUT "COUPON RATE            "
     ;SC(I)
490  PRINT
500  PRINT "REDEMPTION YIELD    (T
     HE MOST RIGHT"
510  INPUT "HAND COLUMN            "
     ;SR(I)
520  PRINT
530  INPUT "STOCK PRICE            "
     ;SP(I)
540 SF(I) = SC(I) * 100 / SP(I)
550 SG(I) = SR(I) - SF(I)
560  NEXT I
570  HOME : REM (CALCULATE RESULT
     S)
580  FOR I = 1 TO N
600 NY(I) = SF(I) * BT / 100 + SG
     (I)
610  IF NY(I) > BR THEN P = I
620  NEXT I
630  PRINT
640  INPUT "PRINTER OR SCREEN (P/
     S)  ";Q$
650  IF Q$ = "P" THEN  GOSUB 1000

660  IF Q$ = "S" THEN  GOSUB 2000

670  PRINT "END,START,OR RE-PRINT
      (E,S,R)  ";: GET Q$
675  PRINT
680  IF Q$ = "E" THEN  HOME : END

690  IF Q$ = "S" THEN  RUN
700  HOME : GOTO 640
1000  REM (PRINTER ROUTINE)
1010  REM (INSERT YOUR OWNHERE.)
1020  PR# 1: REM (PERIPHERAL SLOT
      #1)
1030  GOSUB 3000
1040  PR# 0: PRINT
1050  RETURN
2000  REM (SCREEN RESULTS)
2010  REM (IF YOU DO NOT HAVE A P
     RINTER)
2020  REM (INSERT A PAUSE BETWEEN
      EACH STOCK)
2030  GOSUB 3000
2040  PRINT "PRESS RETURN WHEN RE
     ADY.  ";: GET A$
2050  PRINT
2060  RETURN
3000  REM (OUTPUT RESULTS)
3030  FOR I = 1 TO N
3040  PRINT "STOCK - ";SK$(I)
3045  PRINT
3048  PRINT "STOCK PRICE
      ";SP(I)
3050  PRINT "COUPON RATE
      ";SC(I)"%"
3060  PRINT "FLAT RATE
      ";SF(I)"%"
3070  PRINT "REDEMPTION YIELD
      ";SR(I)"%"
3080  PRINT "CAP GAIN/ANNUM
      ";SG(I)"%"
3090  PRINT "NET REDEM YIELD
      ";NY(I)"%"
3100  PRINT : PRINT : PRINT
3101  NEXT
3110  PRINT "BEST YIELD STOCK FOR
      YOUR TAX"
3120  PRINT "POSITION IS:-"
3130  PRINT
3140  PRINT SK$(P)" WITH A NETT R
     EDEMPTION YELD"
3150  PRINT "OF ";NY(P)"%"
3160  PRINT
3170  RETURN
```

Nine man morris

A high-resolution graphics game has been sent in by M C Prior of Aldershot, Hampshire which provides two players with a board and rule checking for this ancient and celebrated pastime. The board display uses various intensity levels to display black and white counters to the required maximum of nine per side. It then impartially drops them one by one as each side achieves the stipulated strategic state of three up or across, and you remove an opponent's piece.

The display is quite clear and uncluttered, and the rules are simple enough, though they allow forward thinking beyond the point I can manage. The only conflict with common sense is whether you should be allowed a null move — lift from x,y; replace at x,y — which on occasion proves desirable and in this implementation is possible too. You might enjoy applying a patch for that particular quirk — unless you want to retain it as a program feature.

Nine man morris

```
1  REM  NINE MAN MORRIS
2  REM  AUTHOR M.C.PRIOR
3  REM  DATE CREATED:- 8-SEPT-82
4  HOME : VTAB 4
5  HTAB 10: FLASH : PRINT "NINE M
     AN MORRIS": NORMAL : PRINT :
      HTAB 9: PRINT "AUTHOR :- M.
     C.PRIOR": PRINT : PRINT
6  PRINT "THE OBJECT OF THE GAME
     IS TO GET THREE  MEN IN A LI
     NE ON A LINE"
7  PRINT "EITHER VERTICAL OR HORI
     ZONTAL, "
8  PRINT : PRINT : HTAB 10: PRINT
     "BUT ";: FLASH : PRINT "NOT"
     ;: NORMAL : PRINT " DIAGONAL
     "
9  PRINT : PRINT "ON ACHIEVING TH
     IS YOU MAY REMOVE AN     OPP
     ONENTS MAN"
10  VTAB 22
11  PRINT "PRESS RETURN WHEN READ
     Y  ";
12  GET Z$: IF Z$ = "" THEN 12
13  IF Z$ <  >  CHR$ (13) THEN 12

14  HOME
15  VTAB 2: HTAB 7: PRINT "-": VTAB

     3: HTAB 6: PRINT "!";: HTAB
     9: PRINT 1;: HTAB 21: PRINT
     2;: HTAB 33: PRINT 3
16  VTAB 4: HTAB 6: PRINT "!": VTAB

     5: HTAB 6: PRINT "!"
17  VTAB 6: HTAB 4: PRINT "T-!";:
      HTAB 13: PRINT 4;: HTAB 21:
      PRINT 5;: HTAB 31: PRINT 6
18  VTAB 9: HTAB 6: PRINT "!": VTAB

     8: HTAB 6: PRINT "!"
19  VTAB 9: HTAB 7: PRINT "-";: HTAB
 17: PRINT 7;: HTAB 21: PRINT 8;:
      HTAB 25: PRINT 9
```

(continued on page 158)

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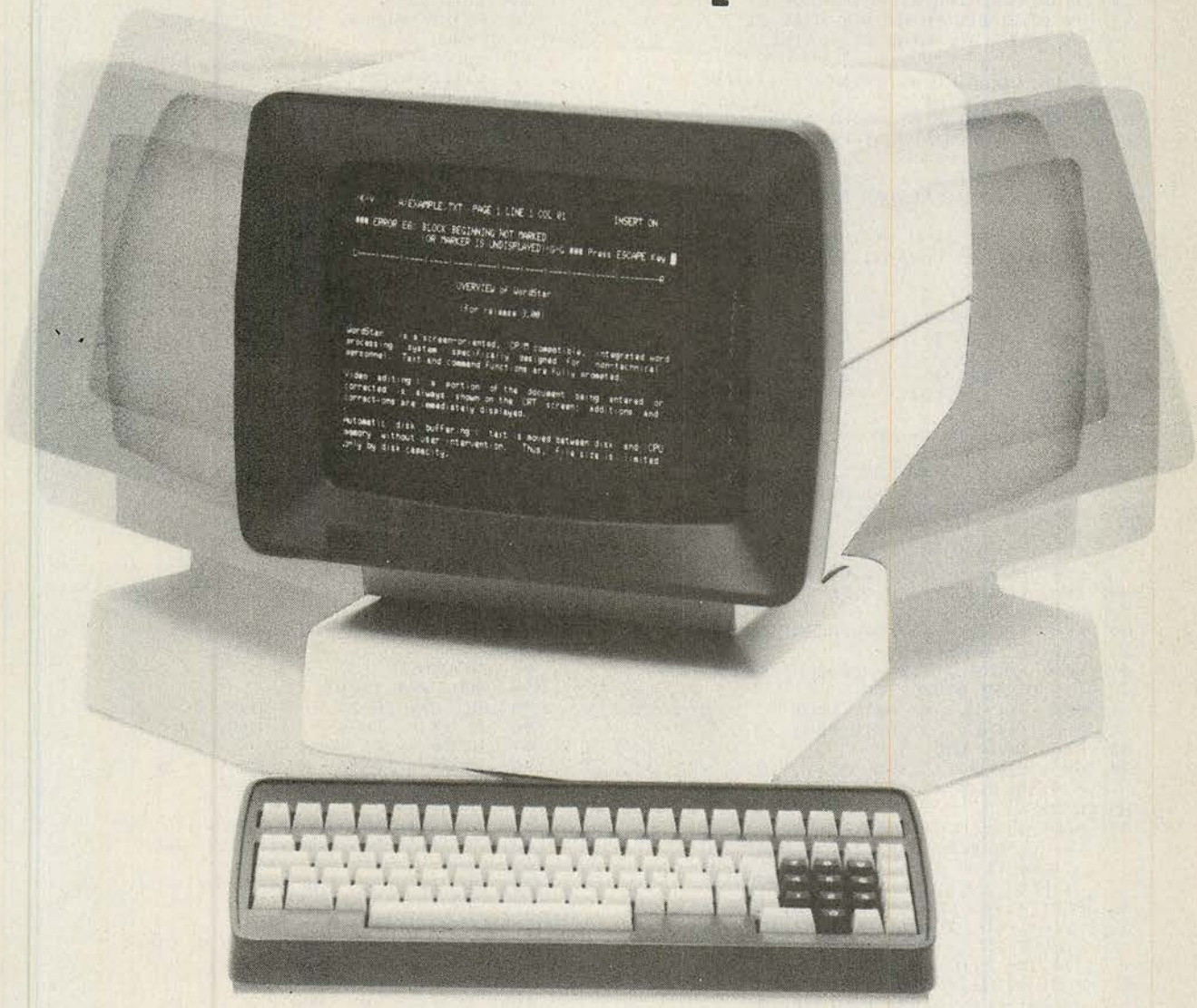

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• Circle No. 173

(continued from page 156)

```
20  VTAB 12: HTAB 4: PRINT "M---"
     ;: HTAB 9: PRINT 1;: HTAB 13
     : PRINT 2;: HTAB 17: PRINT 3
     ;: HTAB 25: PRINT 4;: HTAB 2
     9: PRINT 5;: HTAB 33: PRINT
     6
21  VTAB 14: HTAB 7: PRINT "-"
22  VTAB 15: HTAB 6: PRINT "!";: HTA
B 17: PRINT 1;: HTAB 21: PRINT 2;
     : HTAB 25: PRINT 3
23  VTAB 16: HTAB 6: PRINT "!": VTAB
 17: HTAB 6: PRINT "!"
24  VTAB 18: HTAB 4: PRINT "B-!";
     : HTAB 13: PRINT 4;: HTAB 21
     : PRINT 5;: HTAB 29: PRINT 6

25  VTAB 19: HTAB 6: PRINT "!": VTAB
 20: HTAB 6: PRINT "!"
26  VTAB 21: HTAB 6: PRINT "!";: HTA
B 9: PRINT 7;: HTAB 21: PRINT 8;:
      HTAB 33: PRINT 9
27  VTAB 22: HTAB 7: PRINT "-": PRIN
T : PRINT "PRESS RETURN WHEN READ
     Y  ";
28  GET Z$: IF Z$ = "" THEN 28
29  IF Z$ <  >  CHR$ (13) THEN 28

30  HOME
31  DIM CC(2),MC(1),FL(1),LOC(6,2
     4),PL(7),K(1)
32 K(0) = 0:K(1) = 0
33 FL(0) = 9:FL(1) = 9:CC(0) = 15
     :CC(1) = 0:CC(2) = 13:TURN =
     1
34  FOR J = 1 TO 24:LOC(0,J) = 2:
      NEXT
35  FOR I = 1 TO 4: FOR J = 1 TO
     24: READ LOC(I,J): NEXT J,I
36  FOR I = 1 TO 7: READ PL(I): NEXT

37  FOR I = 5 TO 6: FOR J = 1 TO
     24: READ LOC(I,J): NEXT J,I
38  REM  LOC(0,Z):- W=0, B=1, NOB
     ODY=2
39  REM  LOC(1 & 2,Z)=ADJACENT DO
     TS ONE DIRECTION
40  REM  LOC(3 & 4,Z)=ADJACENT DO
     TS OTHER DIRECTION
41  REM  LOC(5,Z)=X AXIS PLOT
42  REM  LOC(6,Z)=Y AXIS PLOT
43  REM  DRAW BRD.
44  GR : COLOR= 12: FOR I = 0 TO
     39: HLIN 1,32 AT I: NEXT : COLO
R= CC(2)
45  PLOT 4,4: PLOT 16,4: PLOT 28,
     4: PLOT 8,8: PLOT 16,8: PLOT
     24,8: PLOT 12,12: PLOT 16,12
     : PLOT 20,12
46  PLOT 4,16: PLOT 8,16: PLOT 12
     ,16: PLOT 20,16: PLOT 24,16:
      PLOT 28,16: PLOT 12,20: PLOT
     16,20: PLOT 20,20
47  PLOT 8,24: PLOT 16,24: PLOT 2
     4,24: PLOT 4,28: PLOT 16,28:
      PLOT 28,28
48  REM  GET WHOSE TURN
49  GOSUB 89
50  REM  GET INPUT
51  IF K(TURN) = 1 THEN 78
52  PRINT A$;"'S TURN   ";
53  GOSUB 94
54  REM  VERIFY DOT VACANT
55  IF LOC(0,Z) <  > 2 THEN 50
56  REM  OCCUPY DOT
57 LOC(0,Z) = TURN: COLOR= CC(TUR
     N): PLOT PL(X),PL(Y)
58  IF K(TURN) = 1 THEN 78
59 MC(TURN) = MC(TURN) + 1: IF MC
     (TURN) > 8 THEN  PRINT "THAT
     'S ALL YOUR MEN USED.   ":K(
     TURN) = 1
60  REM  CHECK HERE ADJACENT DOTS

61  IF LOC(0,LOC(1,Z)) = TURN AND
     LOC(0,LOC(2,Z)) = TURN THEN
     64
62  IF LOC(0,LOC(3,Z)) = TURN AND
     LOC(0,LOC(4,Z)) = TURN THEN
     64
63  GOTO 48
64  PRINT "WHAT MAN TO REMOVE?  "
     ;
65  GOSUB 94
66  IF LOC(0,LOC(1,Z)) = OP AND L
     OC(0,LOC(2,Z)) = OP THEN 70
67  IF LOC(0,LOC(3,Z)) = OP AND L
     OC(0,LOC(4,Z)) = OP THEN 70
68  IF LOC(0,Z) = TURN THEN 70
69  GOTO 71
70  PRINT "SORRY, NOT HIM": GOTO
     64
71  COLOR= CC(2): PLOT PL(X),PL(Y
     ):LOC(0,Z) = 2
72 FL(OP) = FL(OP) - 1: IF FL(OP)
      < 3 THEN 74
73  GOTO 48
74  PRINT A$;"'S THE WINNER, PLAY
      AGAIN?   ";
75  GET Z$: IF Z$ = "" THEN 75
76  IF Z$ = "Y" THEN  TEXT : HOME
     : CLEAR : RUN
77  GOTO 108
78  PRINT A$;" MOVE FROM  ";
79  GOSUB 94
80  IF LOC(0,Z) <  > TURN THEN 78

81 LOC(0,Z) = 2: COLOR= CC(2): PLOT
     PL(X),PL(Y)
82  PRINT A$;"MOVE TO  ";
83  GOSUB 94
84  IF LOC(0,Z) <  > 2 THEN 82
85 LOC(0,Z) = TURN
86  COLOR= CC(TURN): PLOT PL(X),P
     L(Y)
87  GOTO 60
88  REM  SET WHOSE TURN
89 OP = TURN
90 TURN =  ABS (TURN - 1)
91  IF TURN = 0 THEN A$ = "WHITE
     "
92  IF TURN = 1 THEN A$ = "BLACK
     "
93  RETURN
94  REM  GET INPUT
95  GET Z$: IF Z$ = "" THEN 95
96  IF Z$ =  CHR$ (13) THEN 108
97  IF Z$ = "P" THEN 48
98  IF Z$ <  > "T" AND Z$ <  > "M
     " AND Z$ <  > "B" THEN 95
99  PRINT Z$;
100  GET Y$: IF Y$ = "" THEN 100
101  IF Y$ < "1" AND Y$ > "9" THEN
     100
102  IF Z$ = "M" AND Y$ > "6" THEN
     100
103  PRINT Y$
104 Z =  VAL (Y$): IF Z$ = "M" THEN
     Z = Z + 9
105  IF Z$ = "B" THEN Z = Z + 15
106 X = LOC(5,Z):Y = LOC(6,Z)
107  RETURN
108  TEXT : HOME : END
109  DATA  2,1,1,5,2,4,8,7,7,1,10
     ,7,9,13,3,17,20,16,4,17,6,1,
     17,22
110  DATA  3,3,2,6,8,5,9,9,8,22,1
     2,16,18,15,24,18,23,17,11,23
     ,14,10,20,23
111  DATA  10,5,15,11,4,14,12,2,1
     3,11,4,10,14,6,13,7,16,9,20,
     19,19,23,22,3
112  DATA  22,8,24,19,6,21,16,5,
     18,12,19,11,15,21,14,12,18,1
     3,21,21,20,24,24,15
113  DATA  4,8,12,16,20,24,28
114  DATA 1,4,7,2,4,6,3,4,5,1,2,3
     ,5,6,7,3,4,5,2,4,6,1,4,7
115  DATA 1,1,1,2,2,2,3,3,3,4,4,4
     ,4,4,4,5,5,5,6,6,6,7,7,7
```

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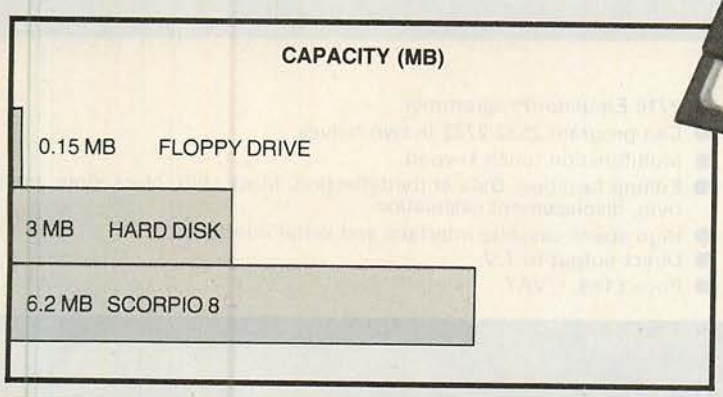

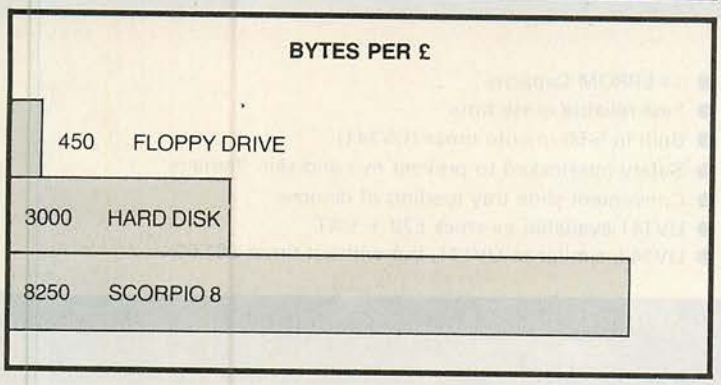

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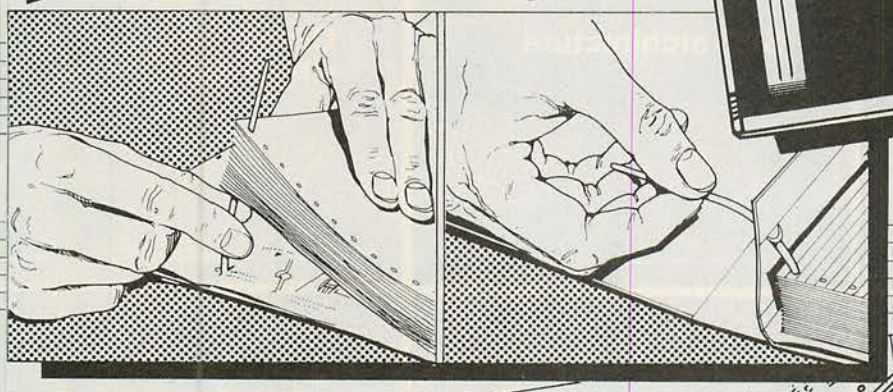

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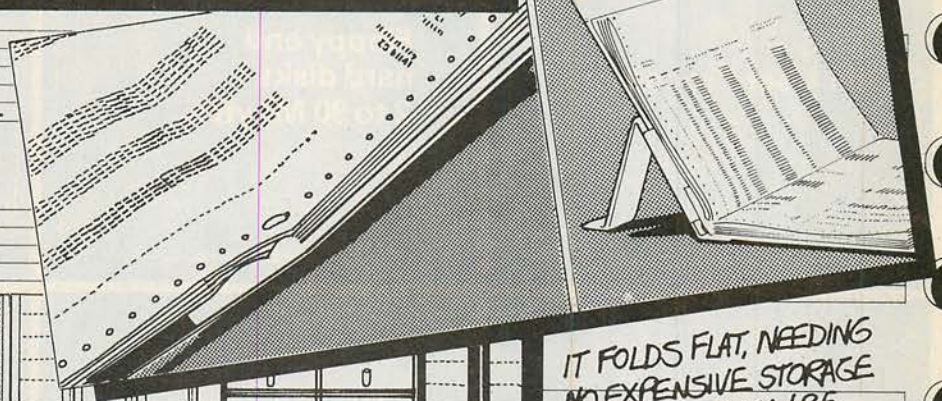

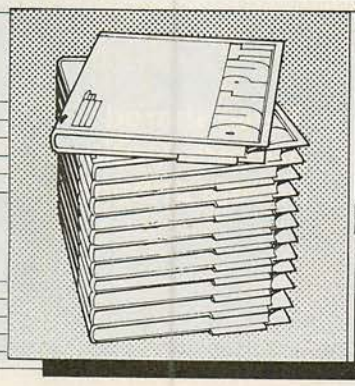

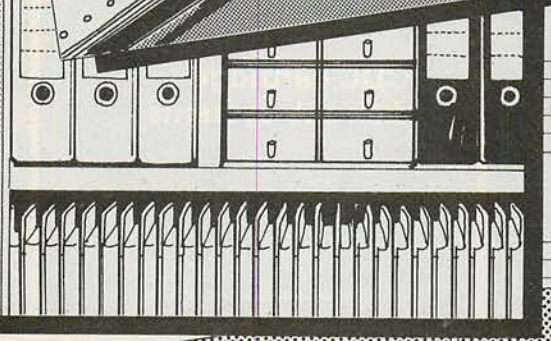

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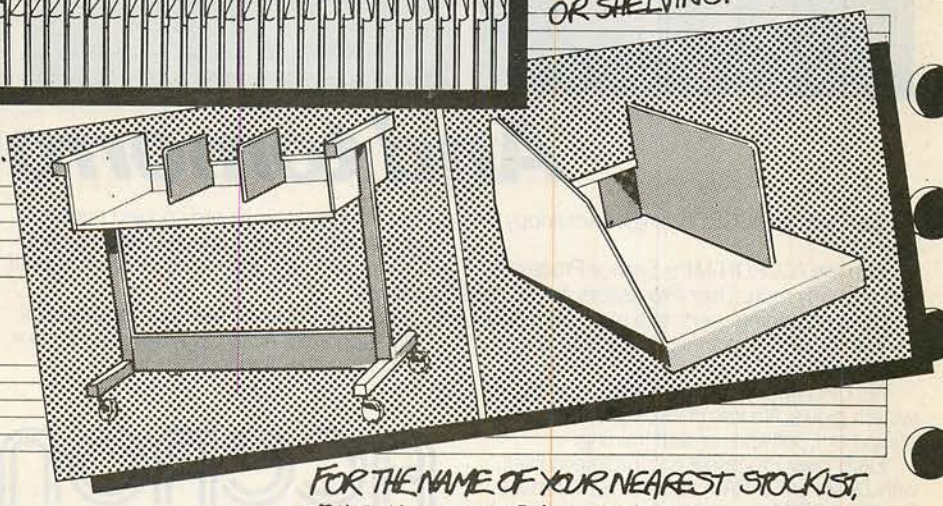

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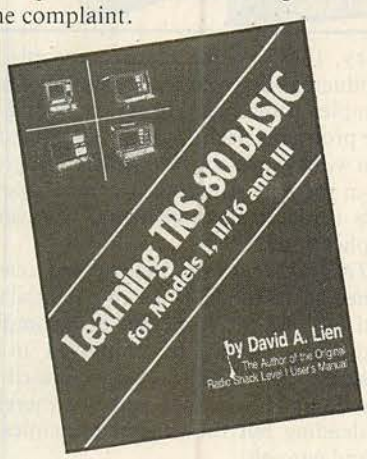
All about Tandy

Michael Trott surveys the literature on the well-established TRS-80 family.

THE TRS-80 is certainly showing its age. Not only does it lack colour but also other facilities of the latest generation of micros. Unfortunately, part of this collection of recent publications is suffering from the same complaint.



It seems appropriate to start with *Learning TRS-80 Basic* by David Lien, the author of the original users' manual. He opens with a short self-congratulatory passage, likely to raise the hackles of all but the least discriminating reader, in which he reminds us of the success of the original manuals. They were reasonable for their time but not that good.

The style of the book will certainly be familiar to those who have used the TRS-80 manuals, indeed at first glance it would appear that several large thin books have been reprinted as one short fat one covering the various TRS-80 models. Lien is honest enough to admit that he quotes freely from the original text. Parts of the book have been rewritten, though, and there is some additional information.

Tandy has not yet stopped issuing copies of the users' guides to purchasers of the TRS-80, which makes one wonder why anyone should bother to purchase this book, especially at the ridiculous price of £14.95. Unless you acquire a secondhand machine with no manual I would give this one a miss.

Explore Computing with the TRS-80 by Richard and Josephine Andree is rather better. It is not intended to replace the users' guide but to complement it. After a brief introduction to the computer the authors tackle elementary programming, providing many well-structured examples that are quite thoroughly explained. There is a heavy bias towards mathematical examples unneccessary in an introductory book, but a close examination of the content leads me to believe that this text would be extremely useful in teaching mathematics with the aid of a computer. Whether this is what it was intended for or whether authors hoped for a more general audience is unclear.

There is a heavy bias towards using the computer for problem solving and the book describes the approach to this clearly and competently. Throughout the book many suggestions for programs are made, ranging from simple to fairly complex, which would satisfy the needs of many new micro users.

Additional information on saving programs, editing, more advanced programming and brief sections on games and simulations are also provided, which makes this an excellent extension to the users' guide

Aimed at the same level, *Programs for Beginners on the TRS-80* by Fred Blechman has much less emphasis on mathematics. It is also rather cheaper. While containing fewer programs it provides more information on each one and aims to teach the reader how to use the essentials of the Basic language.

For each of the 21 programs Blechman explains what the reader will learn, describes the program and explains how it works. Listings, which are not very clearly printed, are provided along with a descriptive list of variables and suggested modifications. Information is also provided for double saving, merging programs and listings for keyboard debounce, and screen printing programs.

The book includes details for building a monitoring box to overcome the loading problems associated with the model I, and a useful table on the final page provides a quick reference guide to whether programs contains operations or statements.

Singularly less impressive is Howard Berenbon's *Mostly Basic: Applications for your TRS-80, Book 2* which provides listings for programs under the headings: education, home applications, money and investment, ESP testing and a fantasy game. The programs are longer than those in the two previous books but the applications are both uninspiring and repetitious, giving the impression that the book contains more programs than it actually does. This combined with the lack of originality and the absence of graphics makes it a book to be avoided at all costs.

The Soft Side Sampler has no pretensions towards teaching, it simply provides listings of 29 entertainment programs reprinted from *Soft Side* magazine. Many of the programs use graphics and some

(continued on next page)

(continued from previous page)

provide sound through a cassette recorder or an external amplifier. One allows speech input to fire torpedoes and another controls voice messages on tape for a spelling test.

The programs are short enough to be typed in without frustration and are introduced by brief and often amusing explanations. The routines employed would be helpful to novices in their own programs.

The really serious programmer will need more help than any of the previous books can provide. *Intermediate Programming for the TRS-80* by David Heiserman aims to fulfil this need, explaining how to get the most from Basic and introducing machine code. Heiserman leads the reader in easy steps through video addressing and cursor controls, keyboard inputs and user-memory organisation to T-Bug and editor/assembler tapes.

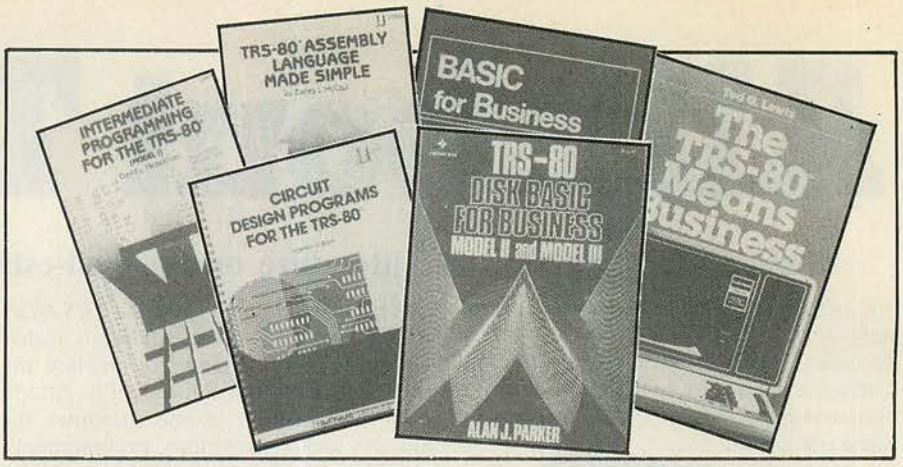
Various examples and demonstrations are used to illustrate the operations described and each topic is fully explained in a clear and reassuring manner. To get the most from the book the reader will also need the T-Bug and editor/assembler tapes and a Z-80 reference manual. Yet even without these Heiserman has produced a really worthwhile guide that will help to build advanced programming skills.

The T-Bug tape is also essential to gain anything from *TRS-80 Assembly Language Made Simple* by Earles McCaul. In addition to providing a guide to the use of assembly language McCaul supplies tables of the Z-80 instruction set, flag effects, a summary of resident Basic ROM subroutines and a decimal-to-hex conversion.

The book has an interesting section covering useful tips for overcoming problems that may be encountered and for obtaining undocumented information. A program is also given to enable the writing of system tapes.

The emphasis of the book is on the use of assembly language rather than on programming. This is achieved through accessing the Level II Basic ROM subroutines; the programming task is reduced to moving the operands into the proper locations and retrieving the results. With such an approach, the author explains, it is possible to write more efficient programs, effectively expanding the available memory. McCaul tackles the task competently in a careful and detailed manner, making this a useful addition to the bookshelf of any intending serious programmer with a limited budget.

Computers can, of course, be used to perform long, complex calculations that would previously have been done by hand, thereby releasing engineers and designers, among others, for more interesting and creative tasks. *Circuit Design Programs for the TRS-80* by Howard Berlin is intended for just this purpose. It provides a variety of program listings for those



wishing to design electronic circuits without the inconvenience of calculating component values. Berlin has produced a useful and interesting aid which includes information for appending subroutines to a program from tape, programs which can be employed for graphs and mathematical routines and tables of standard resistor and capacitor values. Though requiring a good understanding of Level II Basic, the book is, nevertheless, one which is highly recommended.

Finally three business applications books — well, two really since *Basic for Business* and *TRS-80 Disk Basic for Beginners* by Alan Parker are the same book in different covers. Why? Well the author gives this away in the introductory passages. In the first book he claims to be writing for students and in the second to be writing for businessmen: perhaps Mr. Parker and David Lein both feel that the way to make a quick buck is to write one book and keep republishing under different titles — or am I being uncharitable?

Parker starts with an introduction to Basic and leads the reader through data entry, filès, writing reports, records and producing lists to using and designing complex programs. His style is sound and the programs useful, until you realise that you will have to convert the later programs from the American tax system. However, it is a practical introduction to business applications.

TRS-80 Means Business by Ted Lewis is aimed at the model II use or potential user and outlines the functions of a computer and how it may be employed in the business world. The costs outlined are based on U.S. prices and are therefore misleading but the general principles are sound enough.

Ted Lewis's style is less clear than Parker's, but the content is more comprehensive. There is less emphasis on programming and rather more on the underlying concepts involved. The programs discussed in the book are said to be available on disc but you would be well advised to check this before purchasing the book. This book can be recommended, but only if you are considering the purchase of a model II machine. Unfortunately, the TRS-80 range is becoming obsolete.

Learning TRS-80 Basic by David A Lien. Published by Compusoft, 544 pages, £14.95. ISBN 0 932760 08 2

Explore Computing with the TRS-80 by Richard and Josephine Andree. Published by Prentice-Hall International, 230 pages, £8.95. ISBN 0 13 296137 7

Programs for Beginners on the TRS-80 by Fred Blechman. Published by Hayden Book Company, 150 pages, £6.95. ISBN 0 8104 5182 4

Mostly Basic; Applications for Your TRS-80, Book 2 by Howard Berebon. Published by Prentice-Hall, 217 pages, £9.05. ISBN 0 672 21865 8

The Soft Side Sampler edited by Jean Witham. Published by Hayden Book Company, 119 pages, £7.00. ISBN 0 8104 5496 3

Intermediate Programming for the TRS-80 by David L Heiserman. Published by Prentice-Hall, 238 pages, £6.95. ISBN 0 672 21809 7

TRS-80 Assembly Language Made Simple by Earles L.McCaul. Published by Prentice-Hall, 190 pages, £9.70. ISBN 0 672 21851 8

Circuit Design Programs for the TRS-80 by Howard M Berlin. Published by Howard Sams, 138 pages, £10.90. ISBN 0 672 21741 4

Basic for Business by Alan J Parker. Published by Prentice-Hall, 276 pages, £11.95. ISBN 0 8359 0352 4

TRS-80 Disk Basic for Business by Alan J Parker. Published by Prentice-Hall, 276 pages, £11.95. ISBN 0 8359 7872 9

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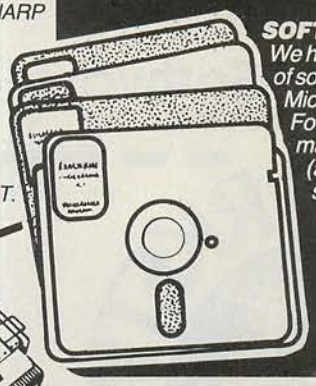

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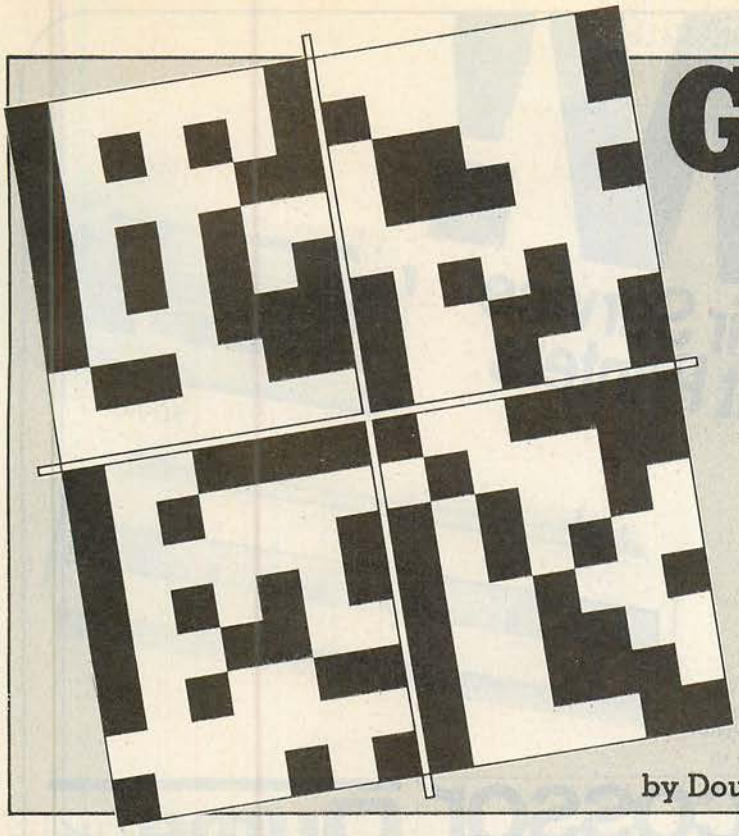

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by Douglas Tate

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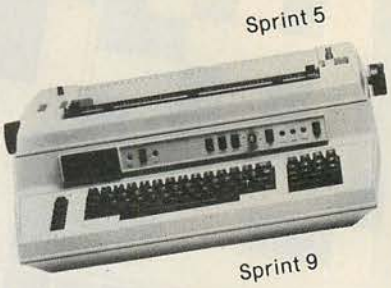

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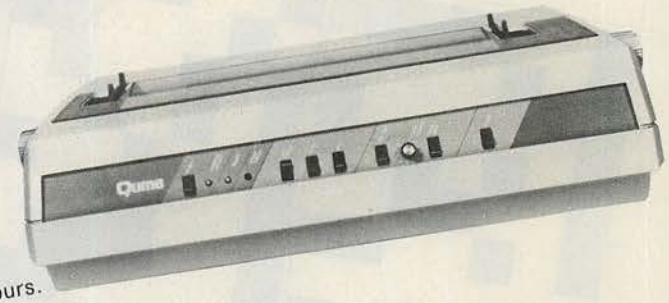

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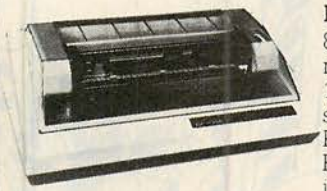

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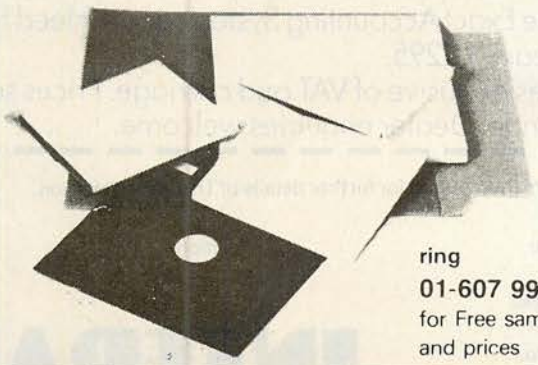

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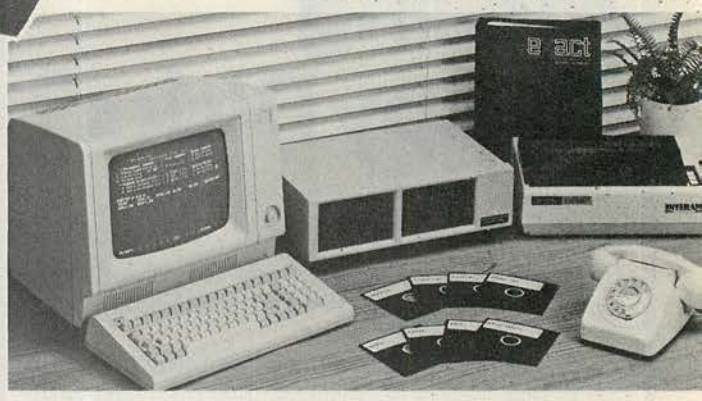

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The new philosopher's stone

Alchemy and the intelligent computer — the quest for both is futile says Boris Allen.

MANY PEOPLE are worried about the effects of computers on their jobs. So far such worries have been confined to what we might call the more mundane occupations — workers on assembly lines, secretaries and typists, book-keepers and similar. Now those who have rather more prestigious occupations are worried because many such occupations are appearing to become equally at risk from what are termed expert systems, an off-shoot of artificial intelligence.

Expert systems attempt to codify expert knowledge and turn it into a form which can be used by the less expert. Expert systems promise a great deal, including the redundancy of many experts who at one time thought that they were safe — computer programmers among them. Artificial intelligence, of which expert systems are an outgrowth, has more than a touch of alchemy to it — AI is an attempt to produce an intelligent computer, about which there have many promises of things to come but relatively few real results.

AI into gold

There have been a few results in AI, and they have been sufficient to keep the subject going as a success. Just as with alchemy, though it was never possible to change base metal into gold sufficient other discoveries were made to keep the alchemists in business. These discoveries then reinforced the alchemists and their backers in further researches. In the case of AI there have been many predictions of what will be achieved "in the near future", yet many are still unfulfilled.

There have been many spin-offs from AI research which have been successful — some of the industrial robots, for example — and so, as with alchemy, we are encouraged to support even more AI research. In 1961 it was confidently predicted that a computer in use then, an IBM 704, if properly programmed, would be able to read printed letters faster than a human. The programs did not then exist; 20 years later I was at a conference during which we were told that there now existed a computerised system for reading books but that the computer had to spend up to an hour learning the printed alphabet used.

The existence of chess machines is often used as a vindication of the power of AI and an indication that a machine can have real intelligence. The program is more complex in that, for example, the methods of looking several moves ahead or retrieving information are more sophisticated. However, the way in which the program decides on the next move is scarcely more sophisticated. The program looks more moves ahead, but does so almost as stupidly as in the past.

To claim that a chess machine exhibits real intelligence because it can beat a person at chess is almost like saying that a pocket calculator is more intelligent because it can multiply more quickly. In many instances the seeming improvement in sophistication of things to do on computers is due more to improvements in the hardware, than they are to the quality of the ideas involved in the software where any intelligence must lie.

The alchemists' search for the philosopher's stone which turned base metals into gold by chemical means was, as we now know, bound to be fruitless because of the atomic nature of matter. Yet the alchemists did achieve some useful results and laid the basis for later chemistry, though their main reason for being alchemists was pointless.

Thinking about thinking

It is argued that AI has set itself an impossible task this will be true for expert systems. There is a mathematical principal, called Gödel's theorem, which implies that a machine cannot be truly intelligent as the computer cannot think about itself. If a computer were programmed to think about itself, then the computer could not think about itself thinking about itself. This may explain why, despite protestations to the contrary, artificial intelligence has not yet created artificial intelligence.

In Britain's Information Technology Year, 1982 there was a vogue for AI expert systems which are supposed to be something like an intelligent assistant, full of specialised knowledge and able to copy some of the ways of thinking humans apply when using such knowledge. In a few cases such systems have been running since the early 1960s. Dendral, for example, is used for mass spectroscopy, and many such systems are used to monitor production of commodities from computer systems programs to cars.

Another example of an expert system is in medicine, where apart from monitoring some blood characteristics the expert system supplies diagnostic advice along the lines of "This reading indicates that the patient is dead." To have an expert system like this has been taken by some enthusiasts to mean too much. They think that because such simple things have been done — which is not to say that they are not useful and time-saving — it follows that the complex diagnoses performed by medical experts can already be done more quickly and more accurately by computer!

Unlikely consultant

To have an expert system which could replace a consultant means that the system has to be intelligent: even ignoring Gödel's theorem, it is still clear that there is a large gap in knowledge between simple monitoring and the work of a medical expert. To give or confirm a diagnosis is quite often a minor part of a consultant's work: many people go to a consultant for advice on the best treatment.

It is possible to construct a computer-assisted learning package for a simple, mainly factual topic such as anaesthetics. It has happened at Glasgow Medical School and it is not very difficult. To find, as they did at Glasgow, that students who used CAL instead of going to tutorials did better at examinations begs many question. What type of examination did the students take, essay or multiple choice? How were the students selected for each type of teaching? How did those who did not attend any teaching, or very little, perform in the examinations? If we test understanding merely by multiple-choice questions in an examination, then the test will fit with CAL tuition.

To suggest — as some of the ES fanatics do — that a couple of years' work is all that is needed to do most of the teaching in schools by CAL, or that in a few years time there will be no need for lecturers, is remarkably unrealistic. Such suggestions are laughable, and more in keeping with promises of AI salesmen of the past.

People worry about the future and new technology, when quite often there is no need to worry. Expert systems are not really expert, artificial intelligence is not really intelligent. The true initiator of our present advances in computing has been nuts and bolts technology, that is better computers. To succeed in the future, be an expert — but best not be a computer expert, they are becoming far too populous — and also learn some computing. It's easy.

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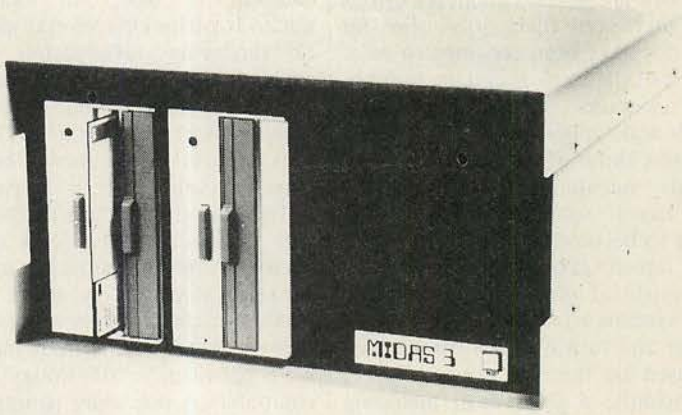

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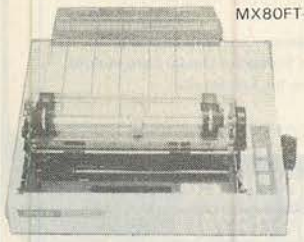

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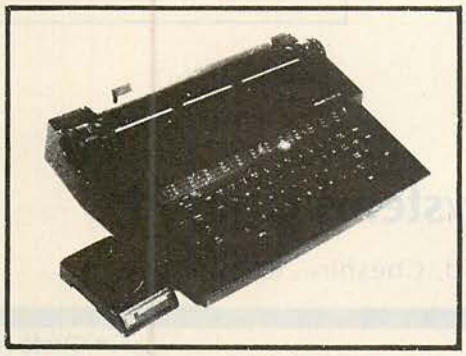

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nĕt'work *(n)* **1.** chain of interconnected persons, operations, or electrical conductors, group of broadcasting stations connected for simultaneous broadcast. **2.** *electronics.* a system of interconnected components or circuits.

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Franciscus Sylvius (died 1672), German anatomist. sym. *abbrev for.* **1.** symbol. **2.** *chem.* symmetrical. **3.** symphony. **4.** symptom.
sȳmbiosis *(n)* **1.** living together in harmony of two organisms of different kinds *esp* to their mutual benefit.
sȳmbiotic *(adj)* — symbiotic computer systems manufacturers of **symbnet** *(n)* **symbfile** *(n) (see over).*

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symb/net. *(n) (see fig 1)* **1.** speedy long range, local area network system, capable of ranges to 9km. utilises fibre optic cable and semi conductor laser to transmit data; **symbnet** enables user to link various microcomputers supported by **symbfile** *(see below)* **2.** compatible with DOS,PASCAL,CP/M; transfer rate 50 kHZ, transmission power 800 micro W cable, fire retardant P.V.C. grade 32, signal insensitive to electrical noise, ∴ cannot be corrupted; system nucleus **symbfile** *(see below).*

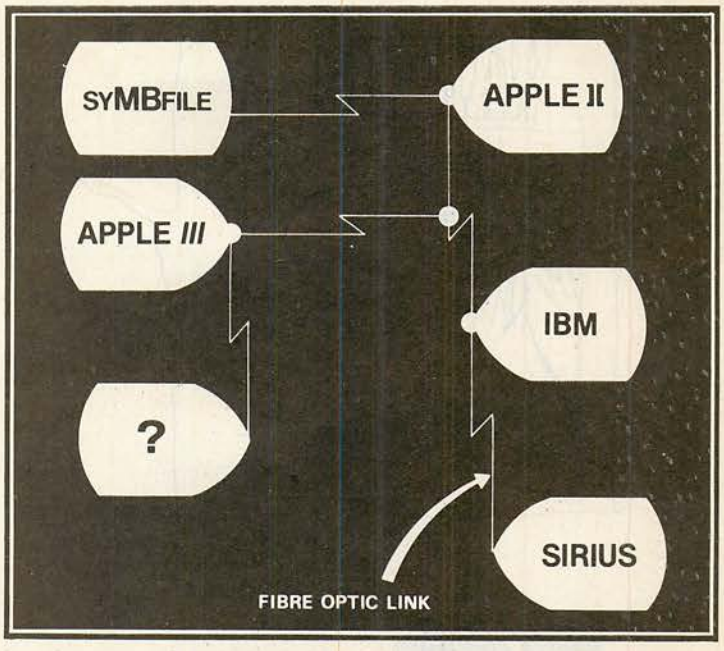

fig 1 **symb/net.**

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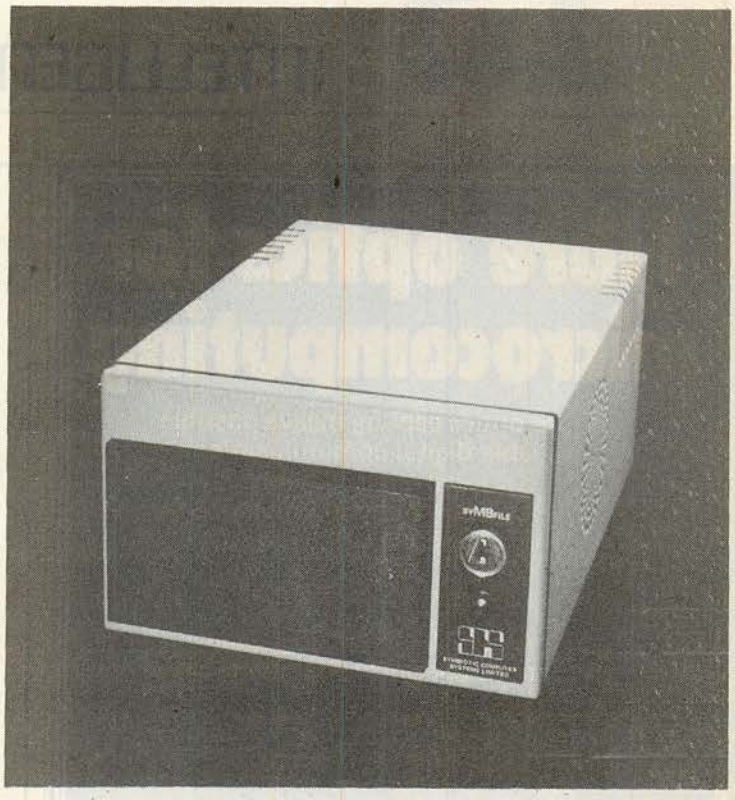

fig II **symb/file**

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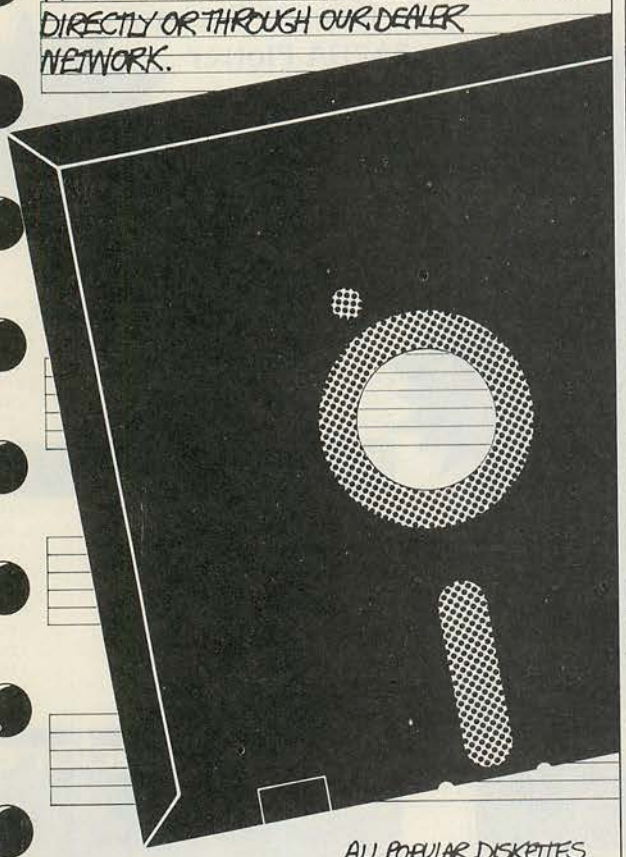

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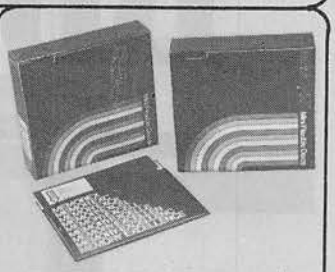

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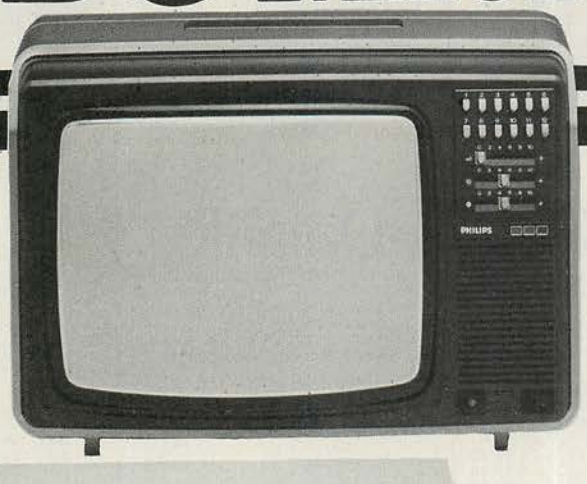

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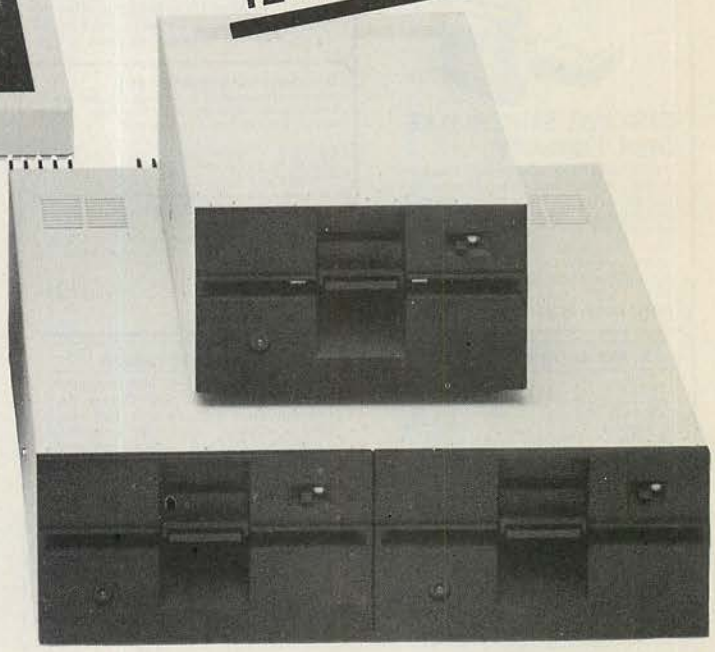

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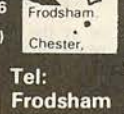

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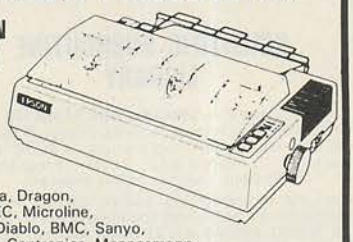

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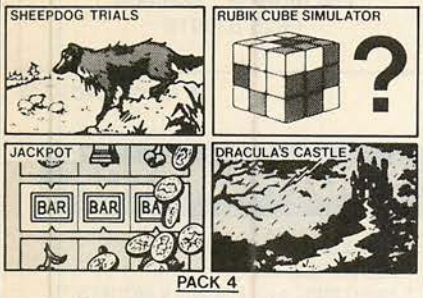

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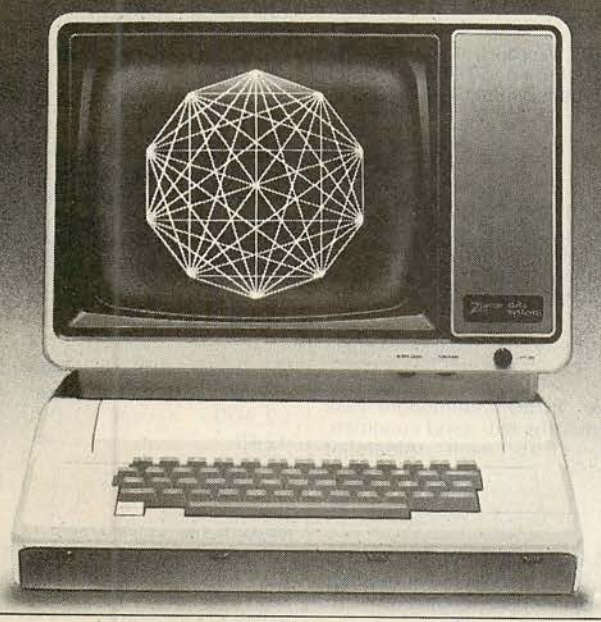

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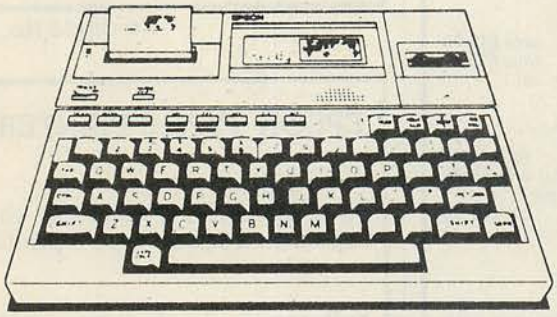

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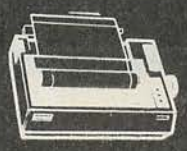

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